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WASTE HEAT RECOVERY

THE efficient use of fuel demands the recovery of waste heat wherever possible in a form in which it can be put to useful purpose. The higher the temperature at which a furnace operates, the greater is the proportion of the incoming heat which must necessarily leave the furnace in the form of sensible heat of the hot products of combustion. Data have been published, for example, by W. A. Moorshead for the glass industry showing that when using hot raw producer gas with 20% excess air the heat available in the furnace without waste heat recovery is only 22% of the input heat for a glass tank operating at 1,350°C. For a furnace with a gas outlet temperature of 1,000°C., which, according to the Paper by J. G. King and F. J. Dent ("GAS JOURNAL" of March 13, p. 435) is the approximate temperature at which the waste gases from a horizontal gas retort enter the recuperator, the available heat is still no more than 45%; if 40% of the escaping waste heat is recovered and returned to the furnace in the form of pre-heated air the available heat rises to 67%.

It is salutary to contrast these figures with those of the coal-fired steam boiler. A well-run Lancashire boiler free from air inleakage should reduce the temperature of the flue gases to about 475°C. (887°F.), at which temperature (according to Moorshead's figures) some 75% of the heat would be available for the boiler. The use of economizers will reduce the outlet temperature to 175°C. (347°F)., thereby making 90% of the heat available for the purpose of raising steam and meeting inevitable losses other than those arising from the sensible heat of the waste gases. The best boiler operators and designers strain every cell in their brains to get another 1% or 2% efficiency from their plant. Does the Gas Industry live up to the same high standard? The boiler operator will worry his hair white over a loss of 1% of the carbon in the original coal which passes unburned into his ashes and clinker. Does the gas engineer worry equally over a loss of 1% of his coke through using too much in the producers or through dust made in cutting and allowed to be wasted? The Gas Industry is (or should be) the very Galahad of fuel efficiency, *sans peur et sans reproche*, for through the application of gas to industry it shows industry how to be thermally efficient.

Waste heat recovery is an all-embracing term, though it is generally used only of the narrow field of heat recovery from products of combustion. The Paper by Drs. King and Dent to which reference has been made gives an account of waste heat utilization in the carbonizing industries, the term "waste heat" being quite properly restricted to the retorts. The coke oven industry has probably taken waste heat recovery and utilization to the highest degree practicable in any industry. Gas-works are not far behind, but have a more complicated problem to face. The simplest form of waste heat recovery is that by which the recoverable heat in the waste gases can be obtained wholly in the form of pre-heated air (or air and gas) and returned in that form to the furnace. This is the method available to coke oven designers, and it is one of which they have taken full advantage. The sensible heat of the waste gases when burning coke oven gas is greater than the maximum sensible heat that can be added to the air in the regenerators. That is inevitable from the volume relationship between combustion air and waste gas, but the excess is sufficient only to provide adequate heat for operating the chimney. The regenerators are highly efficient; well designed regenerators may have an efficiency of 99%, so that for all practical purposes they may be regarded as theoretically efficient. If producer gas is used it is necessary for full heat recovery by regenerators, and in the coke oven it is possible to use cold, clean producer gas and to pre-heat both gas and air to roughly the same extent; the heat capacity of the waste gases at a given temperature is less than the combined heat capacity of the air and producer gas at the same temperature, so that in theory at all events the recovery of waste heat in coke ovens using low grade gas can be better even than when using coke oven gas. All the heat recovered is returned to the system, and therefore the thermal efficiency is very high indeed.

A MATTER FOR ENQUIRY

THE coke oven system has another characteristic in that no waste heat steam is produced. By returning all the recoverable waste heat to the heating system, the minimum quantity of fuel is required for heating the carbonizing chamber. This may be a positive advantage if steam can be raised from low grade fuels. There may be enough coke breeze available at carbonizing works to produce the necessary steam—if the steam utilization practice of the works is as efficient as it should be. It is never desirable as a regular practice to use higher priced fuel in producers for heating retorts and to raise steam from this fuel. By returning the recovered waste heat to the setting, less of the expensive large coke will be needed therein and the works steam can be raised from low-grade fuel. Unfortunately, while this arrangement may be ideal, the amount of coke breeze available at gas-works may be deemed to be insufficient for it to be put into effect. But that is a matter which demands further inquiry.

The problem of waste heat utilization on gas-works is partly technical and partly economic. Before waste heat recovery can be entered upon in the full assurance that the best practice is being employed, it is necessary to know what are the steam and power requirements of the whole gas-works. Gas-works require both power and steam. Some plant will be power-driven; other plant is better steam-driven; and there are operations such as steaming the retorts, or distilling benzole and ammonia, for which steam is needed. The Fuel Efficiency Committee of the Ministry of Fuel and Power has laid down the principle that wherever possible works should generate their own power in pass-out or back-pressure prime movers using the exhaust steam for process work. There are gas-works at which this practice has been extensively adopted, and we hope that someone at these works will come forward with a statement of the minimum steam consumption under these conditions. If there is insufficient coke breeze to produce the necessary steam, it may well be that either (1) the additional steam should be raised from larger coke, or (2) a portion of the power required should be purchased from the grid. There are several ways of utilizing steam, power and heat on a gas-works, and our problem is to discover the best method of so doing in the light of hard economic facts.

STEAM REQUIREMENTS

FIGURES published by F. M. Birks and quoted by Drs. King and Dent show that the steam requirements of a gas-works involved by a particular, but quite normal, policy was between 1,220 and 1,930 lb./ton of coal (from and at 212°F.) in the day-time and 500 to 750 lb. at night, the whole presumably averaging something of the order of 800 to 1,300 lb./ton of coal throughout the whole 24 hours. W. L. Boon and G. W. Lee ("Problems in the Utilization of Small Coals," B.C.U.R.A. Conf., 1944, p. 34) have given figures from which it can be deduced that the average breeze production is about 1.3 cwt. per ton of coal carbonized. The same Authors (*loc. cit.*) have given the

operating results of water-tube boilers with chain-grate stokers burning coke breeze with an actual evaporation of about 7½ lb. of steam (from and at 212°F.) per lb. of coke breeze, a thermal efficiency of about 70%. King and Dent state that an efficiency of 85% is obtainable. Boon and Lee's figures would mean an average hourly production throughout the works of some 1,100 lb. of steam per ton of coal carbonized. This figure is sufficiently close to the average consumption deduced from Mr. Birks' figures to warrant the belief that the possibility exists of making gas-works, like coke ovens, independent of waste heat steam given efficient steam utilization with the purchase of quite a moderate part of the power load from the grid.

Gas-works having horizontal retorts must, of course, face the position that only about half of the recoverable sensible heat in the waste gases can be absorbed by pre-heating the secondary air. It is impossible to recover waste heat in this way to anything like coke oven standards unless clean cool producer gas is used in the retorts and both gas and air are pre-heated. As this would involve sacrificing the sensible heat in the hot producer gas, the policy may not be advantageous. The only alternative is the waste heat boiler to recover the other half of the waste heat. Nor must it be forgotten that the steam produced, whether generated from the breeze or from the waste heat, should be used to produce power before being used for process work. The thermal advantage of this has been pointed out by Professor Kapp as amounting to a saving of about one-third of the heat that would be required if the power and steam were generated in separate installations. Gas-works exist to provide the public with heat in various forms. A saving of this quantity of heat (thereby allowing more for sale) would appear to be desirable; the desirability would be increased if the fuel used were to be met wholly by coke breeze.

RELIABILITY AND CONVENIENCE

THESE are some of the complicated questions that remain to be answered authoritatively in the field of waste heat recovery. Their answer involves enquiry at many gas-works, and considerable work in the collection of field data. It is important, however, that the best practice should be established as an indispensable preliminary to deciding upon the best practice of waste heat recovery, and hence of retort design. It is not only fuel economy that enters into the problem, of course. There are considerations of reliability and convenience also to be taken into account. In the continuous vertical retort the recovery of heat from the hot coke, the pre-heating of the incoming cold coal, considerations of gas-making capacity per unit area, of heat loss from the structure, and many other relevant factors further complicate the issue and have caused recuperators to be abandoned. Drs. King and Dent have given a comprehensive picture of the practice of recovering waste heat in the Gas Industry, but without considering critically many of the considerations and problems to which we invite attention.

The efficiency of waste heat recovery is one thing, and a clear distinction should be made between it and the efficiency of the apparatus in which the heat is recovered. The efficiency of the apparatus (*e.g.*, when used for pre-heating air) is based on the heat in the waste gases and that in the pre-heated air. This efficiency may be expressed by the ratio: heat actually given to the air × 100 divided by the heat that would be given to the air if it were raised to the temperature of the incoming waste gases. This figure, as King and Dent have pointed out, is nearly 100% for coke oven regenerators, and must, in the nature of things, always approach 100% unless the heat recovery apparatus suffers from some mechanical defect. When steady temperature conditions have been established—steady, that is, in the sense that the temperature at any given point is not continuously rising or falling—the heat abstracted by the air must roughly equal the heat absorbed from the waste gases in the recuperator. If this efficiency is not nearly 100%, clearly heat must be leaking away either by conduction to the atmosphere or by leakage of gas and/or air within the heat recovery apparatus. The really significant factor is the efficiency of heat recovery. If, for example, 100 units of heat leave the retort flues in the form of sensible heat of the waste gases, and the pre-heated combustion air contains 40 units of heat (as it may well do in horizontal retort practice), the efficiency of heat recovery by the recuperator is, 40%. But this same recuperator may well be functioning *as a piece of equipment* at an efficiency of 98–99%. From the point of view of heat recovery it is the heat recovery efficiency that matters.

Finally, there is the problem of whether pre-heated air cannot be used for the primary air to the producers. It is possible that a further modification in producer design might be necessary to allow sufficient pre-heat without damaging the grate bars. It seems possible, however, that there may be advantages in pre-heating primary as well as secondary air. The amount of steam that can be carried in a producer depends upon the balance between exothermic and endothermic reactions in the producer. If additional heat were put into the producer in the form of sensible heat, could not the proportion of steam be increased, thereby reducing the quantity of inerts in the waste gases and so reducing the heat loss?

Industrial Application of Atomic Energy

In the "JOURNAL" of August 29, September 5 and 12, and October 24, we published a series of articles on the possible industrial application of atomic energy. We have been interested in a recent Paper given by Professor Sir Charles D. Ellis, F.R.S., Scientific Adviser to the Army Council, on the question of when it may be possible to apply to industry the results of research into the fission of the atom. The contributor of our articles suggested that the first application of this energy might well come in the raising of steam for electricity generation. The same view is shared by Sir Charles Ellis, but in his lecture he remarked that all this new and wonderful nuclear reaction might do would be to replace the boiler producing the steam needed for electricity generation. If its application became possible, he said, it would save the extremely large daily continuous transfer of coal, but all the turbines, dynamos, and other gear would still be required.

Sir Charles continued: "It does not appear likely to promise extremely cheap power. In 1938, according to figures published by the Central Electricity Board, the fuel bill accounted for 28% of the cost of electricity. With the generation of heat by nuclear processes it will be unnecessary to supply any coal, but the rest of the installation will be just about as costly. Obviously, at the moment only a fraction of this 28% can be saved. My personal guess is, considering the initial difficulties of setting up the atomic boiler, that there is most unlikely, in the early stages, to be any margin at all; in fact, it may well prove more expensive. I think at all costs we must avoid running away with the idea that we are about to enter upon a period of extremely cheap power; but, on the other hand, I am by no means suggesting that power aspects of this discovery are not of great importance."

The lecturer had previously discussed the probable design of what he termed "an atomic furnace," consisting of a suitably shielded pile of uranium billets surrounded by specially prepared carbon, and adequately cooled so that the neutron gas would not be raised to too high a temperature to lessen its effect on the release of energy. He continued: "Even if somebody produced an atomic furnace to-morrow in working order I would still advise you to pin your faith in your coal merchant for keeping warm next winter. However, when this process does eventually get going it will make an appreciable difference to our total power supply in this country. You can see this in a very simple way. The order of magnitude of the size of the atomic furnaces will probably be about one-third or half a million kilowatts. Now the total amount of electricity used in Great Britain is about at the rate of 4,000,000 kWs., so that one or two atomic furnaces would mean a perceptible increase in electric power. This, of course, is only a small proportion of the total power in the form of coal used in Great Britain. There is no question of doubling such power or solving our main coal problem. Broadly, therefore, I would say that we are in time going to have atomic furnaces. They will be of tremendous importance in the location of industry and they will make a noticeable addition to our total power, but you will have to wait a considerable time before you can enjoy these advantages."

Government Plans

This question of the release of atomic energy for industrial purposes was discussed at some length in the House of Commons on Thursday last, when, in reply to several questions, the Minister of Supply and of Aircraft Production stated categorically that the harnessing of atomic energy for peaceful purposes had not yet been solved, and that there was no justification for the belief that therein lay a quick or easy solution of industrial problems. It would, he suggested, be some years before direct results of any value to industry could be achieved, and it was doubtful if the achievements of the next 10 years could be of any widespread industrial application. He added that it was most likely that atomic energy would be used for the production of electrical power.

Mr. Wilmot went on to say that the first stage of the work of extensive designing and planning was going forward and that a special organization had been established for the purpose, and work was starting. Accommodation for a team of experts at present in Canada had been made available at the Ministry of Supply factory at Risley, near Warrington. Engineering and other expert staff was being recruited. Examination of sites for the main production plant was now going forward, but no decision had yet been made. Meanwhile, the Ministry's factory at Springfields, near Preston, had been selected for the site of a subsidiary plant for processing materials. The Government's policy was to encourage and support in every way research at universities and elsewhere on fundamental problems which might, at any time, lead to discoveries of prime importance in this new field of nuclear energy. They were mobilizing the best brains, and were prepared to devote as large a sector of the national effort as could be spared to this development, whch they regarded as of transcending importance. It might well be that they were within sight of the greatest industrial power revolution in the history of the world.

Road Tar Research and Practice

Last Wednesday the British Road Tar Association entertained members of the Press to lunch—a pleasant and effective way of launching the two Bulletins to which reference is made on later pages of this issue. The Chairman, Mr. J. Davidson Pratt, O.B.E., asked specially that it be made known that copies of these Bulletins, which owing to paper shortage cannot be broadcast, can be obtained free of charge on application to the B.R.T.A. Mr. Pratt also referred to "Wartime Specification 76," which some people imagined covered a kind of "austerity" tar. Actually it is a very much better product than pre-war qualities.

Personal

Mr. E. W. ARGENT and Mr. C. H. HUDSON, both Sales Directors for many years, have been appointed joint Managing Directors of Sternol, Ltd. They have been associated with the firm for over 26 years.

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On the retirement of Mr. J. N. WHYTE, General Manager and Engineer of the Montevideo Gas and Dry Dock Company, Mr. W. A. H. KEELEY, London Manager and Secretary, has been appointed General Manager and Secretary, and Mr. J. RAWLE has been appointed Chief Engineer and General Manager in Montevideo.

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The following appointments have been made in the South Metropolitan Gas Company: Mr. H. M. BROWNE, Gas Service Manager; Mr. FRANK WHITE, B.Sc.(Eng.), A.C.G.I., M.I.C.E., Distribution Engineer in succession to the late Mr. L. F. McLeod; Mr. C. STOTT, B.Sc.(Leeds), A.R.I.C., M.I.Chem.E., Engineer-in-Charge of the East Greenwich Works in succession to Mr. White; Mr. A. D. L. COPP, A.M.I.C.E., Assistant Engineer-in-Charge of the East Greenwich Works.

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Mr. E. H. CHAPELOW, Sales Manager of the Durham Gas Company, was the guest of honour at a dinner recently held to mark the occasion of his retirement after 53 years' service. A presentation was made to Mr. Chapelow by Alderman T. W. Holiday, J.P., Chairman of the Directors, who spoke in high terms of Mr. Chapelow's service with the Company and of the esteem in which he was held by the Board. Alderman Holiday was accompanied by his co-directors and by Mr. A. S. Middleton, Secretary, Mr. R. W. Nicholls, Engineer, and members of the staff. Mr. Middleton referred to the fact that this was probably a unique occasion in that never before had an employee completed half a century with the Company. Mr. Chapelow, in reply, recalled many experiences during his long period of service, and spoke of the many changes which had taken place since he first joined the staff.

After 36 years' service with the Newcastle-under-Lyme Gas Department, Mr. F. L. WIMHURST retires from the position of General Manager at the end of this month. Mr. Wimhurst, whose father was Engineer and Manager of the Sleaford Gas Company, and whose brother has recently retired from the post of Engineer and Manager at Bury St. Edmunds, went to Newcastle in 1910 after having been Assistant Manager at Newmarket and Cambridge, and since his appointment the output of gas has increased from 100 million to 520 million cu.ft. per annum.

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Mr. V. F. SIDDONS has retired from his position as Superintendent, Mains Department, to the Sheffield and District Gas Company, after 26 years' service. At a social function on April 1 he received a presentation from the chief officers of the Company; he has also been the recipient of gifts from foremen and workmen of other departments. When Mr. Siddons joined the Company in 1920 the total length of gas mains was 600 miles; to-day the figure stands at 1,400 miles. Mr. Siddons supervised the installation of the trunk mains linking up 13 coke ovens to the Company's distribution system under the South Yorkshire Gas Grid extension scheme, and also the laying of connecting mains to the outside areas absorbed by the Company. Mr. H. FIRTH has been appointed to succeed Mr. Siddons as Mains Department Superintendent.

Obituary

The death has occurred at the age of 80 of Mr. T. MAIRS, of Caistor, Lincs, formerly for 52 years Manager of the Caistor Gas Company.

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After an illness lasting several months, the death occurred at his home at Woldingham, Surrey, on Mar. 20, of Mr. A. C. H. BELL THOMPSON. Mr. Thompson joined the predecessors of Sternol, Ltd., in 1892 and gave his whole time and attention to the development of the oil trade in this country. He was Managing Director of Sternol, Ltd., from its inception. By election of the oil trade he served for many years on the Grand Council of the Federation of British Industries.

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The Gas Industry has lost one of its best known personalities by the death of Sir ALBERT BALL, Chairman of the Nottingham Gas Committee, which occurred in a nursing home at Bournemouth on Mar. 27. Sir Albert, who was 83 years of age, had been a member of the Gas Committee for 46 years, and was re-elected Chairman for the 40th successive year last November. Throughout his chairmanship he consistently pursued a policy of development of efficient working arrangements, and in close co-operation with the Engineer and Manager he had the satisfaction of seeing the undertaking maintain a leading place among the municipal undertakings of the country. He was for several years a Vice-President of the British Commercial Gas Association, a member of the National Gas Council, and the Federation of Gas Employers. He was Mayor of Nottingham in 1909–10 and 1920, and Lord Mayor in 1935–36, and was the father of Captain Albert Ball, V.C., airman of the 1914–18 war.

Letter to the Editor

Plain Speaking

DEAR SIR,—I am writing to endorse the opinions set out in Dr. Foxwell's letter in your issue of March 6.

Although I consider myself as a technical man, I have many times been bewildered when reading papers and reports from some of our ultra-scientific workers, and have wondered whether it was due to my own ignorance.

Having read Dr. Foxwell's opinion in this matter I am encouraged to think that I may belong to a majority, possibly a large one, which does not understand quite a lot of what is written for the benefit of the members of the Institution and other workers in the Gas Industry.

April 2, 1946. Yours faithfully,

G. M. GILL.

Messrs. Babcock & Wilcox, Ltd., announce that they have now transferred the whole of the Babcock valve business and the manufacturing capacity of their Dumbarton Valve Works to Messrs. Dewrance & Co., Ltd., whose business they acquired some years ago. Messrs. Dewrance & Co., Ltd. will, however, continue to operate as a separate organization, and will continue to manufacture, supply, and service certain designs of Babcock valves.

Dundee Gas Department reports an unprecedented gas consumption and demand for gas cookers. In the month ended Mar. 15 the Department sent out 30 million cu.ft. more than in the corresponding period last year. Cooker supplies are becoming more plentiful, and 51 were sold in the month, against 40 for the previous month, for new housing schemes. A thousand consumers have indicated a desire to buy their own cookers and 300 to buy water heaters of various types, supplies of which are also improving slowly.

Road Tar Bulletins

As we have mentioned earlier in this issue of the "JOURNAL," the Chairman of the Road Tar Research Committee, Mr. J. Davidson Pratt, at a luncheon of the British Road Tar Association on Wednesday last, referred to the issue of road tar bulletins, calling particular attention to bulletins numbers 1 and 2. The first deals with full-scale surface dressing experiments, and the second is concerned with the question of viscosity of tar. These bulletins form a series of notes arising as results of research and experiment on road tar carried out prior to and during the war. Researches were undertaken by the Road Research Organization of the Department of Scientific and Industrial Research, and by laboratories of member firms of the British Road Tar Association. Necessarily the work has entailed full-scale tests on highways, and these have been carried out with the collaboration of the experimental section of the Ministry of War Transport.

We have referred to bulletin number 1, which was issued in June of 1943, already in the "JOURNAL." Bulletin number 2, dealing with viscosity of road tars, shows how the experimental work has led to the development of new and modified testing apparatus both at the road research laboratory and in the laboratories of road tar producers, for investigating the viscosities of road tar and pitches. Bulletin number 2 which, well illustrated, comprises a booklet of 40 pages, concerns itself primarily with the Equi-Viscous Temperature system of expressing viscosity, which system enables viscosities within the range to be accommodated on a single scale. The system is of special value to those concerned with the fluxing and blending of tars.

In a summary to bulletin number 2 it is stated that the viscosity of tar changes markedly with temperature according to a simple relationship. The temperature susceptibility increases with increase of E.V.T., but is independent of the source of the tar. Also, the loss of a small proportion of oil causes a relatively large increase in viscosity. This emphasizes the importance of avoiding overheating or prolonged heating of road tar during use. Many modern methods of road construction require tars of higher viscosity than can conveniently be handled in barrels, and there is, therefore, every reason to recommend the extension of bulk delivery to pre-mix plants and the use of mechanical sprayers for surface dressing.

North Middlesex Training Scheme

During the war approximately eighty men and lads joined H.M. Forces from the Fitting Staff of the North Middlesex Gas Company. As they return they are taken through a three weeks' course of intensive training in the fixing of meters, cookers, fires and water heaters. Trainees are formed into classes of eight, and are taken right through the course, both practice and theory. An examination is given at the end of the term. Special bays have been built which enable the younger men to have practice in the lifting of floor-boards and

chasing of walls before having to carry this out on the consumers' premises. Fitters engaged in taking this course are encouraged to enter for their higher examinations to enable them to become C, B, and A class fitters. Lead bending, hot and cold setting of iron barrel, joint blowing and wiping are among the many classes of work carried out, and special attention is given to the maintenance of water heaters and refrigerators and the testing of governors. Estimators, representatives, and showroom salesmen are also given three weeks' training, part of which is taken at the makers' stove works to give them an insight into the manufacture of modern apparatus. Until the Company's own workshop was finished, workshops at the Hendon Technical College were loaned by the Middlesex County Council, to enable the training to carry on.

Institution Examinations

The examinations of the Institution of Gas Engineers in Gas Engineering (Manufacture) will be held on May 18, and in Gas Engineering (Supply) on May 25.

Candidates for the 1946 Examinations in Higher and Diploma Grade Examinations in Gas Engineering (Manufacture) and (Supply) are informed that, except in special cases, no oral examinations will be held this year.

Those candidates required to attend for an oral examination will be notified in due course. Such oral examinations will take place on July 3.

Diary

April 4.—Midland Junior Gas Association: "The Post-War Transition," J. K. Mitchell (Dudley).

April 5.—North of England Gas Managers' Association: Informal Meeting to inspect a 3-million cu.ft. welded spiral gasholder in course of construction at South Gosforth, Newcastle-on-Tyne. Bus leaves Central Station at 2.30 p.m.

April 6.—Scottish Junior Gas Association (Eastern District): Short Paper Day at Dunfermline.

April 6.—Yorkshire Junior Gas Association: "Carbonization," H. Dearnley (Leeds), Strafford Arms Hotel, Wakefield, 2.30 p.m.

April 9.—Joint Consultative Committee (Domestic Development Committee and Society of British Gas Industries): Gas Industry House, 10.30 a.m.

April 9.—British Gas Council: 2.30 p.m., Gas Industry House.

April 9.—National Federation of Gas Coke Associations: General Committee, 10 a.m., Gas Industry House.

April 10.—Domestic Development Committee: Gas Industry House, 10.30 a.m.

April 10.—London and Southern District Junior Gas Association: Visit to Watson House.

April 10.—North-Western Fuel Luncheon Club: "Research in the Fuel Industry," Dr. E. V. Evans, Engineers' Club, Albert Square, Manchester, 12.30 for 12.45 p.m.

April 12.—Institution of Chemical Engineers: 24th Annual Corporate Meeting, Connaught Rooms, W.C. 2, 11 a.m.; Presidential Address, Hugh Griffiths, 12 noon; Luncheon, 1 p.m.

April 12.—North British Association of Gas Managers: Spring Meeting, Lesser Town Hall, Coatbridge, 10.30 a.m. Presidential Address, Mr. T. S. Lockhart, Rothesay.

April 15.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

April 16.—Midland Junior Gas Association: "Group Chemical Service," O. H. W. Boonham (Cheltenham).

April 17.—Industrial Gas Centres Committee: Gas Industry House, 10 a.m.

April 26.—Manchester District Association of Gas Engineers: Annual Meeting; Presidential Address, G. E. Currier.

April 26.—London and Southern District Junior Gas Association: "Power Plant and Machinery for Exhausting and Boosting of Gas," L. J. Clark, Gas Industry House, 7 p.m.

April 26.—Southern Association of Gas Engineers and Managers (Eastern District): "The Place of the Gas Industry in the National Fuel Economy," Dr. G. E. Foxwell, Gas Industry House, 2.30 p.m.

April 27.—Manchester and District Junior Gas Association: Visit to Liverpool; Discussion on Report of the Gas Installations Committee (Ministry of Works Post-War Building Studies, No. 6), to be opened by R. J. Rogers, Chairman of the Committee.

April 27.—Scottish Junior Gas Association (Eastern District): Visit to a Colliery of the Fife Coal Co., Ltd.

April 30.—Institute of Fuel: Whole Day Conference on Waste Heat Recovery, Burlington House, Piccadilly.

Mr. D. R. Hardman, Parliamentary Secretary to the Ministry of Education, replying to a debate on technical education raised by Major Wells on the motion for the adjournment in the Commons, said that the Government intended to set up a National Council of Technology to work with the Universities and with industry, and also to establish national colleges for industry. Mr. Hardman said that the importance of technical education and its status in the Britain of the next 50 years could not be exaggerated. The Ministry had sent out a circular on Feb. 20, which represented the first move towards the establishment of a national system of regional organization. As soon as these regional councils were set up they would establish a National Council of Technology, which would co-ordinate the work of the regions and ensure there was a comprehensive national viewpoint. The chief function of these bodies would be to link up local authorities with the Universities and with industry. Within the last 18 months the demand for technical training had increased out of all knowledge.

Intensive Courses for Gas Engineers

We announced some weeks ago the initiation of a series of intensive refresher courses for gas engineers. We are now able to publish further details of these courses, which have been arranged by the Gas Education Committee of the Institution of Gas Engineers in collaboration with the Ministry of Labour and National Service and the Ministry of Education.

Negotiations with the Ministries have continued, and the first intensive courses are to be commenced on April 29, 1946, at the Bournemouth Municipal College. They are being conducted by the College in collaboration with the Bournemouth Gas and Water Company, and are intended primarily for candidates who have obtained the Ordinary Grade Certificate in Gas Engineering (Manufacture) or (Supply), but candidates who have reached a standard approximating closely thereto may be admitted, subject to the approval of the Gas Education Committee of the Instiution, and of the Principal of the College. The present courses are designed to take these candidates to the Higher Grade Standard by Christmas, 1946, and provide for approximately 10 students in Manufacture and approximately 10 in Supply. The ancillary subjects will be studied at the Municipal College, and examinations in those subjects will be conducted by the College at the conclusion of the course. The main subject will be studied at the works or offices of the Gas Company, and the examination will be conducted at the conclusion of the course by the Board of Examiners of the Institution of Gas Engineers.

The subjects to be taken in these courses are as follows:

	Hours per week.	
	Class work.	Practical and laboratory work.
GAS ENGINEERING (MANUFACTURE):		
Practical Mathematics S.3	5	—
Applied Mechanics S.3	2	3
Heat Engines and Hydraulics, S.3	2	3
Electrical Engineering, S.2	2	3
Gas Engineering (Manufacture)	10	
GAS ENGINEERING (SUPPLY):		
Practical Mathematics, S.3	5	—
Applied Mechanics, S.3	2	3
Inorganic Chemistry, S.2	2	3
Physics, S.2	2	3
Gas Engineering (Supply)	10	

The courses, as detailed above, will each consist of two terms at the Municipal College, from April 29 until mid-July and from mid-September until Christmas, 1946. The intermediate period will be utilized for practical training at a gas undertaking, which, as far as possible, will be provided by the Bournemouth Gas and Water Company.

The above-mentioned courses may not be suitable for every candidate, although they are expected to meet the requirements of the majority. The Principal of the College will be prepared, as far as is practicable, to consider, in co-operation with the Gas Education Committee of the Institution, minor modifications of the courses, as far as ancillary subjects are concerned, to meet individual requirements.

The cost of the course in either syllabus, Gas Engineering (Manufacture) or Gas Engineering (Supply), excluding the cost of text-books, is approximately £21. The cost of text-books is expected to be approximately £10. Candidates intending to attend the course are advised to communicate with the Principal of the Bournemouth Municipal College, Mr. C. E. Walker, M.A., B.Sc., L.C.P., and with Mr. J. T. Haynes, M.Inst.C.E., Engineer and Manager of the Bournemouth Gas and Water Company, 136, Old Christchurch Road, Bournemouth.

It is appreciated that the securing of living accommodation at Bournemouth is not an easy matter, but the Engineer and Manager of the Gas Company has kindly offered to assist as far as possible candidates who experience difficulty in this connexion.

The Ministry of Labour and National Service will pay grants covering the cost of the course, the cost of necessary text-books, examination fees and maintenance up to a maximum sum of £160 per annum in the case of a single person, with an additional sum not exceeding £110 per annum in respect of a wife and £40 per annum in respect of each child. The award of a grant is restricted to candidates who have undertaken a period of full-time effective service in work of national importance during the war, and who can satisfy the Ministry of Labour and National Service that by reason of this service they have suffered interruption of training for a career in Gas Engineering.

Application for an award must be made to the Regional Appointments Officer of the Ministry of Labour and National Service at one of the undermentioned addresses, and should be made as soon as the date of demobilization of the candidate is reasonably certain:

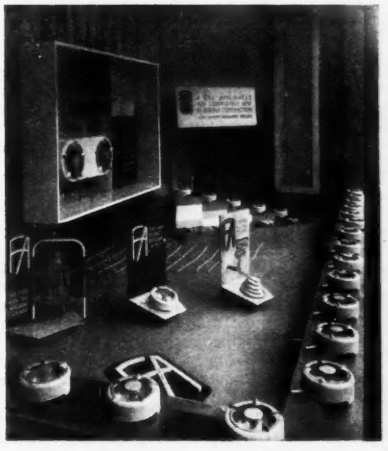
Birmingham	Patrick Motors Building, Broad Street, Birmingham.
Bristol	91, Pembroke Road, Bristol, 8. Bristol 38241.
Cambridge	2nd Floor, Lloyds Bank Chambers, Hobson Street, Cambridge. Cambridge, 55288.
Cardiff	8, Cathedral Road, Cardiff. Cardiff 8327–31.
Edinburgh	5, Rothesay Terrace, Edinburgh, 3. Edinburgh 22121.
Glasgow	450, Sauchiehall Street, Glasgow, C.3. Glasgow Douglas 7161.
Leeds	Lloyds Bank Chambers, Vicar Lane, Leeds. Leeds 30474.
Liverpool	Cotton Exchange, Bixteth Street, Liverpool. Central 7446.
London	1–6, Tavistock Square, W.C. 1. Euston 4383.
Manchester	Royal Exchange Building, Bank Street, St. Ann's Square, Manchester, 2. Blackfriars 5173–6.
Newcastle-upon-Tyne	153, Barras Bridge, Newcastle-upon-Tyne, 2. Newcastle-upon-Tyne 22477–9.
Nottingham	Commerce Chambers, Upper Parliament Street, Nottingham. Nottingham 46711–3.
Reading	23, Valpy Street, Reading, Berkshire. Reading 4801–6.

It is desired to point out that the courses are open to any member of the Gas Industry possessing the necessary qualifications, although the payment of maintenance grants, &c., by the Government will be confined to those satisfying the requirements of eligibility under the Further Education and Training Scheme. In the event, however, of the number of applicants exceeding the vacancies available, preference will be given to men demobilized from the Forces or returning to the Industry from other work of national importance.

It is intended to commence similar courses at the Birmingham Central Technical College on June 1, 1946, if sufficient candidates are forthcoming to warrant their initiation. The courses at present envisaged are of similar standard to the Bournemouth course, and are intended to take the candidate of Ordinary Grade Standard in either Gas Engineering (Manufacture) or Gas Engineering (Supply) to Higher Grade Standard in approximately 22 weeks.

The Gas Education Committee of the Institution has in mind also the initiation of Courses for the Ordinary Grade Certificate, should the demand be sufficiently great.

A "Neat" Window



Our photograph is of a window display of "Neat" gas appliances in the showrooms of the Glasgow Gas Department. It represents the first complete window display which Messrs. Friedman - Athill have put forward.

The Cargo Fleet Iron Co., Ltd., Middlesbrough, has successfully produced in large quantities one of the medium broad flange beam sections mostly in demand, namely, 10 in. by 10 in., in lengths up to 90 ft., of a quality and finish comparable with the best continental and American standards, where broad flange beams are said to have largely replaced ordinary standard joists. The Company is proceeding to develop from the smallest range of sizes up to 20 in. by 12 in. to meet steel constructional requirements. Structural engineers will, therefore, be able economically to design their buildings to include the ranges that will shortly be available, and which can be extensively used in post-war reconstruction, with a material saving in steel and cost of fabrication over the standard joist.

Nationalization and the Gas Industry

We continue to-day our recording of the comments made and resolutions passed concerning the proposed nationalization of the Gas Industry. This follows our references in the "JOURNAL" of March 6 and 20. Our abstracts cover both company-owned and municipally-owned gas undertakings.

Mr. **A. M. Paddon,** who through indisposition was not able to be present at the annual meeting of the Brighton, Hove & Worthing Gas Company and whose speech was read by the Deputy Chairman, Mr. Frank H. Jones, stated:

"While the Government has announced its irrevocable decision to nationalize the Gas Industry, it has not disclosed any information as to how it proposes to implement its purpose. Certain inevitable consequences must issue, unless the Government intention is meaningless . . . the interest of the consumers can hardly be consulted by the release of many statutory provisions now existing for their protection."

Referring to his own Company, Mr. Paddon continued:

"The Company is subject to regulative penalties as to the conditions, such as the quality and pressure of the commodity it supplies, while the price of gas is linked with any profit that may be distributed; also the issue of capital and rate of interest are matters of legislative control. These and many other qualifications on behalf of the consumers and the public cannot obtain under Government control, against which there can be no legal process. It would appear, therefore, that any concession or consideration extended to the public could be only gratuitous—a poor exchange for legal rights. For wellnigh a century this Company has been prominent in promoting practical and administrative efficiency within the Gas Industry. Much of the accepted technical practice now extant has had its genesis within its orbit. Is it conceivable that any benefit can accrue from the arbitrary transfer of an organization the product of unremittent professional and personal skill, as an impersonal and unrecognizable element, into the nebulous volume of Ministerial control? Is it not rather to be anticipated that such a transposition will merely reproduce the deterioration which in the past has invariably attended the supersession of private enterprise? The prospect is dark, and is hardly susceptible of improvement until it is generally recognized that industrial, as well as personal, liberty is essential to national prosperity."

* * *

Mr. **William Cash,** Chairman of the Bournemouth Gas and Water Company:

Mr. Cash, having mentioned the British Gas Council accept neither the principle of nationalization nor the scheme suggested by the Heyworth Committee if nationalization is forced on the Gas Industry, emphasized that whatever happens development must continue, and that renewal programmes cannot be postponed when demand steadily increases. "This Company," he said "is both a gas and water company, and if our gas undertaking is acquired, we should have a claim for severance. A considerable part of our organization deals with both undertakings, and we should be left with the one business only. Our costs would be relatively higher."

* * *

Mr. **Henry Woodall,** at the annual meeting of the Tottenham and District Gas Company:

"We can only assume that nationalization means the compulsory purchase by the State of your property on terms which you may have little opportunity of discussing and criticizing. It seems to have been assumed by the public that nationalization will automatically result in economies; there is no justification for such an assumption, but if, as we believe, it is wrong, its error can unfortunately only be proved after much damage has been done and the remedy made correspondingly difficult.

"We are of the opinion that some form of statutory control over the Gas Industry is advisable. Such control has existed for over a century, and relates, for example, to the raising of capital, the quality and price of gas, and the dividends paid to the shareholders. Parliament, therefore, already exercises very wide powers. We hope that the Government will realize before it is too late that these are sufficient to prevent any abuse by the Gas Industry of the statutory powers, under which it operates, and that the heavy cost and disturbance which nationalization would entail are wholly unjustifiable."

He added that it should be clearly understood that the Industry does not approve nationalization from any point of view. Concerning the Heyworth Committee's recommendations regarding a greater degree of integration, he pointed out that in 1911 the Company's area of supply was only 16 square miles, while to-day it is 411.

* * *

Speaking as a stockholder at the annual meeting of the British Gas Light Company on March 27, Commander **Hyde C. Burton** expressed the hope that the Board would not regard the nationalization of the Gas Industry as inevitable. With one Ministry after another making blunders, the Government might cave in, and it seemed to him that the Gas Industry was taking a rather supine view in not making every endeavour to prevent its nationalization, instead of saying, in effect, "If you say we cannot discuss the policy we will consent to work with you." That was an attitude which would not inspire the general public, who were after all the final arbiters as to whether or not nationalization was to be carried into effect.

The Chairman (**Mr. Henry Woodall**) said he rather thought he was taking the same line as Commander Burton. He had never taken the line that nationalization was inevitable, and he had said so in his remarks; neither did he think the Directors were weak-kneed about it.

Commander **Burton** said in his opinion the spokesmen for the Federation of British Industries at the conference with the Prime Minister and his colleagues should have demanded from the Government a *quid pro quo* in terms of co-operation. They might have suggested that if the Government would put its nationalization Bills on the shelf they would co-operate, but until and unless they did so they could not count on such co-operation.

The **Chairman** said he sympathized with Commander Burton's views. He held similar views himself, and he thought he could say the same of the other Directors.

After considering a report by the City Chamberlain on the financial implications of the Heyworth Committee's report, the Aberdeen Finance Committee at the end of last month recommended that the Gas Industry in Scotland should continue under the ownership and control of local authorities. The City Chamberlain, in his report, said that any settlement on the basis of outstanding debt would not appear to be reasonable unless it could be guaranteed that the consumers would in the future continue to derive benefit from the small figure of outstanding debt. In the event of the undertaking being nationalized, a further very important point was that the Corporation would lose the advantage of income tax set-off in respect of which the rates benefited to the extent of about £70,000 over the past five years.

* * *

The Falkirk Gas Commttee are to submit a resolution for consideration at the annual convention of the Royal Burghs to be held this month:

"That this Convention is of the opinion that any proposal to nationalize the Gas Industry in Scotland other than through the medium of local authority control is, in view of the particular circumstances obtaining in the Industry in this country, undesirable and unnecessary as not being in the interests of the general body of consumers, the majority of whom are supplied by local authorities."

Dingwall Town Council, having asked the Ministry of Fuel and Power to approve an increase of 2s. 6d. per 1,000 cu.ft. in the price of gas, has received approval of an increase of 1s. 8d., making a total of 10s. 10d. per 1,000 cu.ft. For the time being, however, the Council has decided not to impose the new price, but to consider the position further in three months.

The Glasgow firm of Ezee Kitchens, Ltd., has set up a new Scottish industry, the designing and manufacture of modern kitchen equipment, in a former aircraft factory at Alloa. The firm will design and market the equipment, while manufacture is by the Harland Engineering Co., Ltd. It is estimated that 200 workers will be employed to meet home requirements.

Increased Charges for gas due to extra cost of coal, wages and materials have been approved by the West Bromwich Town Council. The average increases represent an additional cost of 2d. to 4d. a week according to consumption, and for prepayment meters there is to be a flat rate of 4s/7d. per 1,000 cu.ft. The Gas Committee reported that in the last financial year there was a deficiency of £987, but it was estimated that the new scales (still below those of many authorities) would provide additional revenue of approximately £23,000.

We have received an attractive 28-page brochure describing the products of the Waterless Gasholder Company, Ltd. The advantages of this type of holder are set out at some length, the claims made being that they eliminate the freezing risk, are able to maintain gas in a drier condition, and ensure steady pressure, which may be increased as desired. Such holders are, it is stated, far easier to erect than the water-sealed type and require only moderate foundations. Should ground subsidence occur they may be jacked up with little trouble. For positions where underground conditions are uncertain, such as may be found in mining districts, waterless holders may be erected over existing tanks or adjusted to allow ground level storage. These holders may be extended in height without the need for temporarily placing them out of action.

Chances of corrosion are slight, for the inside shell surfaces are protected by a preservative film below piston level, and external painting need not be limited to water-resisting paints and may be carried out in any desired colour. Various uses for waterless holders are discussed, and the brochure is generously illustrated with drawings and photographs. The individual contractors for the Waterless Gasholder Company are R. & J. Dempster, Ltd., R. Dempster & Sons, Ltd., Clayton, Son & Co., Ltd., and E. Cockey & Sons, Ltd.

Midland Association

The Annual Meeting of the Midland Association of Gas Engineers and Managers was held at Birmingham on Mar. 28. Mr. A. B. Britton (Hinckley), the retiring President, occupied the chair prior to the installation of Mr. G. P. Mitchell (Worcester) as his successor. Congratulations were extended to Mr. G. C. Pearson on the O.B.E. conferred upon him by the King.

The following elections were made: *Vice-President*, P. Dougall (Kidderminster); *Hon. Secretary and Treasurer*, J. H. Wainwright (Halesowen), with thanks for past services; *Committee*, O. S. Brettle, W. L. S. Spinks, and K. L. Pearce; *Auditors*, J. Corrigan and S. J. D. Williams; *Council of the Institution of Gas Engineers*, J. H. Wainwright; *Midland District Education Committee*, G. C. Pearson, C. F. W. Rendle, H. R. Hems, and S. K. Hawthorn.

New members of the Association were elected as follows: J. O. Branson, W. M. Larner, J. F. Lord, S. Scott, F. N. Tidball, J. E. Wakeford, and E. L. Wallace.

The **Secretary** referred to the work of the Midland Commercial Gas Association, and said a report was to be presented shortly. That there had not been more meetings of the Association was due to the fact that there was very little work that could be done at the present time, principally because of the very large number of other meetings that had taken precedence.

Mr. **H. R. Hems** reported that the Midland District Education Committee had had an active year, and he paid tribute to the enthusiasm of the members. The main work of the Committee was to assist in the general education of future gas engineers, and to co-operate with the Gas Education Committee at headquarters to the best of its ability so far as any activities in the Midlands were concerned. The ordinary work, that of assisting students, had not been very extensive, but one of the main pieces of work had been that on the intensive courses for returning demobilized men. Negotiations had been proceeding between the Institution and the technical colleges, and courses were actually being started at Bournemouth. It had been hoped to arrange courses at Birmingham, and the Committee had been in touch with Dr. Anderson, Principal of the Technical College, who was ready to provide the courses as soon as the Industry could provide the students. Through the kindness of Mr. Lee they had analyzed the position in Birmingham, and they hoped to provide the nucleus of the course. A big question was that of finance, and they had persuaded the Gas Education Committee to recommend that if finance was holding up the scheme the Institution Council should consider backing it. A notice had gone out to all undertakings setting out the general basis of the scheme, and stating that courses were to start at Birmingham early in June.

In the absence of Mr. T. F. E. Rhead, the **Secretary** read a brief report on the position of the Midland Gas and Allied Industries University Collaboration Committee. Correspondence with the Ministry of Fuel was distinctly encouraging, and it was hoped to call a meeting of the Committee shortly.

The **Secretary** reported on the work of the Council of the Institution of Gas Engineers.

Mr. **Britton,** in retiring from the Presidency, thanked the members for their support, and said that one of the outstanding features of his period of office had been their close contact with the Midland Junior Gas Association. It was a mistake to interpret the word "junior" too literally, for there were some very live wires among the Midland Juniors. He had attended as many of their meetings as possible, and not only had he found them pleasant and instructive, but he had been impressed with the keenness of the younger men in the Industry. He then inducted Mr. Mitchell as President, and wished him a happy year of office.

Mr. **Mitchell** said they all appreciated the hard work Mr. Britton had done. He was sorry that under prevailing conditions the presentation of the President's Medal had to be deferred until a later date. The new President then delivered his Presidential Address, which will be dealt with in a later issue of the "JOURNAL."

Nationalization and the Heyworth Report

Mr. **R. S. Ramsden** (Leamington), in proposing a vote of thanks to the President, said it was difficult to prepare a Presidential Address when so many topics were in the melting-pot. Probably somebody would send a copy of Mr. Mitchell's Address to Mr. Shinwell and ask him what was going to happen to the Gas Industry. An elderly spinster now living in Lancashire who had been a shareholder in the Leamington Priors Gas Company for over 50 years had written in great distress asking what was going to happen to her dividends and her shares; was she going to find them confiscated or replaced by scrip that would not be negotiable? Such problems were worrying quite a lot of shareholders in gas undertakings. Mr. Mitchell had touched on a number of topics, and he congratulated him on the sound position that the Worcester Company still held.

Mr. **W. Macnaughton** (Wolverhampton), who seconded, said that when he entered the Industry several years ago he was appointed to a works that had been designed by the President's father. It was not usual for a Highlander to pat a Lowlander on the back, but as he had been asked to second the vote of thanks he did so very gladly. Mr. Mitchell had given them a lead for the new world of the future.

Dr. **E. W. Smith,** President of the Institute of Fuel, supporting the vote of thanks, congratulated Mr. Mitchell on his courage in bringing forward a subject which was inadequately discussed within the Industry to-day. The Industry in general, as distinct from closed meetings at headquarters, was not discussing the details of nationalization and the Heyworth Report as it should. He suspected that there would not be any large developments of the proposals now on foot for quite a long time, and as one who was vitally interested in the Industry he would suggest that a very carefully organized meeting, with a carefully organized agenda, ought to be arranged to discuss the proposals of the Minister of Fuel and Power that were on foot at the present time. Only in that way would the Minister be in a position to get experience and a knowledge of the snags that were certain to arise. He thought one of the most difficult problems was going to be that of arranging the finances. It was absolutely essential that stocks should be negotiable, and that they should be saleable in the open market at least as freely as gas companies' stock or local authorities' loans were saleable to-day. If they did not ensure that, there were hundreds of thousands of small holders of stock who would suffer, and that was a thing which no Government could afford to do if they wished to remain in office.

Mr. **F. C. Briggs** (Dudley) said that when one got on to the subject of nationalization one could discuss quite a lot, but it was difficult to know what the policy was, and what was the correct policy for them. The Government had said they were to be nationalized, and the Prime Minister had regarded the Heyworth Report as manna from heaven, but he had not said whether they were going to accept it. Therefore, with the large amount of responsibility they were carrying in their day-to-day work one was reluctant to discuss something that might in the end prove to be quite futile. Nevertheless the matter was being discussed, and the Management Committee of the British Gas Council in the district was discussing the report. He for one felt that as policy was really the outstanding feature, this matter could more adequately be discussed by the British Gas Council in the district than by an association of gas engineers, who were not mainly responsible for policy. He hoped there would be a very full discussion by the Management Committee of the British Gas Council, but he could not agree that it should be a public meeting. The results of the meeting would be communicated to headquarters, and it was for headquarters to say whether or not a report should be issued to the public.

Mr. **K. L. Pearce** (Bilston), President of the Midland Junior Gas Association, conveyed the greetings of his members to the new President, and said that it was a coincidence that, like Worcester, his own undertaking was celebrating its centenary this year. A hundred years ago it was a small unit in a very large organization in the Midlands, and it broke away because of the inefficient service that was being given in those days. Now it appeared that history was likely to repeat itself in the sense of reverting from the individual undertaking to the large organization.

The **President,** responding to the vote of thanks, invited the members to visit Worcester on the occasion of their summer meeting. That meeting would be rather later than usual this year, as it was desired to synchronize it with the centenary celebrations, which were due to be held in July.

A Training Discussion Group

We have received particulars of a Group which has been formed for the interchange of ideas for those responsible for the education and training in commercial and industrial organizations in the Greater London area. The Group meets monthly on the first Tuesday at 6.15 p.m. at the Westminster Technical Institute, Vincent Square, S.W. 1.

The Chairman is Mr. R. N. LeFevre, Training and Education Officer of the Gas Light and Coke Company, and the members of the Committee are as follows: John Clark, B.Sc., A.I.I.A., Miss A. L. G. Hewitt, B.A., M.I.I.A., J. A. Horne, H. Howell, A.I.P.E., Margaret Joyce, and Angus Roy, Ph.D. Alice Coward, B.A., is Hon. Sec. and Treasurer.

The programme for the next three months is as follows: May 7, "Evening classes and part-time education; What members' firms are doing"; June 4, "Selection and training of instructors for firms having training schemes"; July 2, Visit to the Gas Light and Coke Company's training centre at Fulham, S.W.

Many Schools throughout the country will, it is to be hoped, shortly be teaching children about the smoke menace through a booklet, *The Smoke Problem and Scientific Teaching*, to be issued by the National Smoke Abatement Society. The lessons suggested are designed to show how coal deposits were formed, and through a series of experiments the formation of soot through faulty combustion. Pupils will be encouraged to make elementary meteorological observations, also for soot deposits and damage to buildings, objects, and vegetation through atmospheric pollution. The final lesson deals with methods of smoke prevention.

Removal of Sulphur Compounds from Town Gas by Catalytic Hydrogenation

By E. B. MAXTED, D.Sc., and J. J. PRIESTLEY, M.Sc. (W. C. Holmes & Co., Ltd.)

(*Continued from p. 516*)

Attention is drawn to certain items. Firstly, the quantity of hydrogen consumed is based on an average oxygen percentage of 1.1%. This figure should not be taken as the oxygen figure required to keep the plant in operation, but is the average oxygen consumed over the period of test and is a higher figure than would normally be required. Oxygen figures at Mirfield usually run higher than are required, and as has been explained in the previous section, this brought the cold gas by-pass into operation, thereby dispensing with the surplus heat, in order to keep the catalyst temperature reasonably constant. There are no means of avoiding using up the oxygen during its passage through the CSR plant, therefore the whole of it appears as a charge against the process.

The capital charges are taken at 10% per annum based on 1944 labour and material costs.

The cost of catalyst replacement is higher than we would normally cater for. This is due to the fact that the best quality of bauxite for the job could not be obtained, namely, one having a very hard grain, owing to the difficulties of wartime conditions, and the fact that bauxite is normally imported. Catalyst replacement represents in this case losses by reduction of the grain size, by breakage, the dust below $\frac{1}{16}$ in. being sieved out after its regeneration. When supplies of bauxite of pre-war quality become available we anticipate this figure to be a fraction of that shown on the cost sheet. No charge is made for oxide used in the catch box, as even if new oxide is used this can be used later in the main purifiers at the gas-works. It will be seen from this table that the actual 1944/45 cost at Mirfield of sulphur removal amounts to 0.239d. per therm, or 1.17d. per 1,000 cu.ft. This is exclusive of taking into account extra revenue received for a lower sulphur benzole, which at Mirfield is of the order of £100 p.a.

Catalyst Manufacture (Patent No. 567, 273/43)

The method of manufacture of, say, copper thiomolybdate catalyst is to prepare the copper molybdate, which is a pale blue insoluble solid, dissolve this in excess ammonia, then allow this solution to be absorbed by calcined bauxite. After soaking, the bauxite is subjected to heat when the excess of ammonia is driven off, and the copper molybdate precipitated in the pores of the bauxite.

The requisite weight of molybdenum trioxide is dissolved in 25% ammonia diluted with water to the required volume in a vertical paddle mixer. After the whole of the molybdenum trioxide is dissolved the copper sulphate is added to the mixer. The pale blue precipitate of copper molybdate is redissolved by adding a slight excess of ammonia.

The bauxite on which the active material is to be mounted is placed in a cylindrical steel basket which stands in a soaking tank. Copper molybdate solution is pumped across into the soaking tank, and the liquid continuously circulated by a pump drawing from the bottom of the tank and sprayed on the bauxite from above.

After about 12 hours' spraying the basket is withdrawn from the tank and the wet material charged in the hopper of a gas-fired rotary drier. A gentle current of air is passed through the drier during the operation. The catalyst is raised to a temperature of approximately 400°C. during treatment not only to drive off the excess of ammonia, but also to evolve the ammonium sulphate formed by the double decomposition of ammonium molybdate and copper sulphate. It is essential to have all the ammonium sulphate driven off at this stage, otherwise it would come off in the converter and settle on the heat exchanger tubes.

On discharge the catalyst is allowed to cool, and any dust formed in the manufacture screened out of it. The catalyst is then converted into copper thiomolybdate by treatment with gas at 300/400°C. containing H_2S or other sulphur compounds. The catalyst is now ready for use.

Catalyst Regeneration

Catalyst normally discharged from the converter contains approximately 10% of its weight of carbon, which has to be removed by combustion. In carrying out this process it is essential not to overheat the catalyst, otherwise the catalyst is damaged, either by sintering, which reduces the porosity of the support, or alternatively the more volatile active elements—*e.g.*, molybdenum—are volatilized. The carbon is deposited from the gas phase and is highly active, and with air the combustion will proceed at great speed unless the air rate is carefully controlled. An alternative method, and one we have adopted at Mirfield, is to dilute the air with flue gases, with or without steam, so that the oxygen content never exceeds about 5%. Air and coal gas are fed into an automatic proportioning burner adjusted to give about 5% oxygen in the flue gases. The sensible heat of the flue gases is used to raise and maintain the catalyst at a temperature sufficient to maintain carbon combustion. Owing to the low oxygen percentage the combustion proceeds at a gentle and uniform rate, and the large quantity of inerts in the flue gases are able to carry away the surplus heat as produced.

In the regenerator, fig. 14 (Patent applied for), the catalyst is maintained in position in an annulus made of stout wire mesh similar in shape to the catalyst basket in the converter. Situated at the base

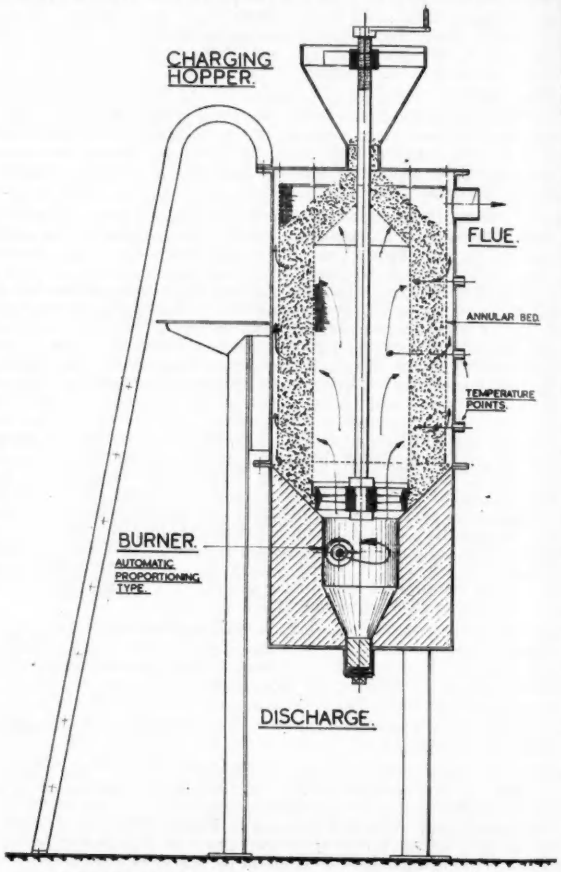


FIG. 14.—*Catalyst regenerator.* (*Patent applied for.*)

of the cylinder is a fire-brick lining, the sloping upper surface of which forms the confining wall of the catalyst situated in the annulus. The catalyst is prevented from running out at the bottom of the inner cylinder of the annulus by a circular valve, supported by a spindle situated centrally within the cylinder and supported at the top in a screwed collar. In order to discharge the catalyst the spindle is rotated by a handle, the valve raised, and the catalyst allowed to discharge from the annulus through the combustion chamber and out through a plug at the base.

In normal operation the apparatus is filled with catalyst and the burner lighted, the temperature of the catalyst is allowed to rise to 600°C. and then is maintained there. A charge of 5 cu.ft. is usually regenerated in 5 to 7 days, though in the early days a check was kept on the rate of combustion by analyses for CO_2 of the ingoing and outgoing cleansing gases.

It has been found that the apparatus is extremely simple to operate and is absolutely fool-proof. It is possible to regenerate in this apparatus batches which have only been partially fouled, and to recommence the regeneration of any batch the treatment of which had been interrupted. The gas consumption of the burner is approximately 35 cu.ft. of gas per hour. Again, as on the converter, it is possible to treat catalyst continuously through this apparatus.

The Removal of Sulphur Compounds at the Works of the Specialized Consumer

In the case of the specialized consumer using town gas for process work there is often a specific disadvantage in having sulphur present, as, apart from the general harmful effects of corrosion, sulphur is capable of spoiling the goods which are being processed by chemical

action with the material of which the goods are made or decorated. As an instance of this, a gas containing a high proportion of sulphur compounds will, when used in the processing of glass-ware, impart a bluish-white "bloom" on the glass itself, due to the combination of sulphur with the materials present in the glass.

The competition of electricity in the field of high-temperature processing, where a harmless furnace atmosphere is required, is considerable, and unless town gas which is reasonably free from sulphur compounds can be provided, the Gas Industry will not be in a position to compete for this load. Below is an abbreviated list of some of the industries in which the presence of sulphur in furnace atmospheres is definitely harmful:

(1) *The Glass Industry.*—The disadvantages attendant on the presence of sulphur compounds in the processing of glass-ware have been described in considerable detail by Mr. J. A. Tomes ("The Use of Town Gas in the Processing of Glass Tableware," Paper to Midland Junior Gas Association, January 11, 1945). Briefly stated, bloom formation is more troublesome with lead glass than soda glass, as the lead sulphate formed is insoluble in water and can only be removed by acid washing, which dissolves a thin film of glass from the surface. Apart from the unsightly milkiness given to the ware, bloom prevents the parts of ware—*e.g.*, jug handles—from sticking to the body of the article in the correct manner. Such parts have been known to leave the article some considerable time after manufacture. Blooming can take place in gloryhole furnaces, annealing lehrs, and edge fusion machines.

(2) *The Pottery Industry.*—Present practice in the pottery industry is to protect the ware during firing by the use of saggars, which are hollow lidded containers made of earthenware. These perform a double function, firstly of supporting the ware, sand being packed between the articles for this purpose, and secondly to protect the ware from the action of the sulphur in the furnace atmosphere. The thermal efficiency of this process is put at about 10%, which would be increased to 30% or 40% if saggars could be dispensed with and open firing adopted. The present tendency in the industry appears to be to adopt town gas as a fuel on an increasing scale in preference to producer gas. If town gas is freed from its final organic sulphur and open firing adopted, this would mean a considerable saving of fuel in the industry. In addition the load could be secured for the gas in preference to the electrical industry. There is at least one electrically heated tunnel kiln using open firing already in this country.

The nuisance value of sulphur is in its deleterious attack on glazes, colours and enamels used in the decoration of the pottery.

(3) *Metallurgical Industries.*—This field, covering ferrous and non-ferrous metals, is probably the widest of all. Examples only can be quoted here. The scaling of steel is profoundly influenced by the several factors, including the presence of sulphur dioxide. Low sulphur gas is of value as a consequence in processes such as billet heating and bright annealing. In the non-ferrous metal industry nickel may be quoted. Sulphur causes serious embrittlement of the metal, and the organic sulphur normally present in town gas is sufficient to cause trouble in billet heating prior to rolling.

Several CSR units for the removal of sulphur compounds from town gas have been installed in consumers' works in different parts of the country. Gas volumes of up to 15,000 cu.ft. of gas per hour are being dealt with, the reduction in sulphur compounds obtained being dependent on local gas-making conditions at the gas-works, particularly the type of coal carbonized, the type of retort plant, and the degree of benzole stripping achieved.

The plants require virtually no attention, and are economical in operation. The overall cost of sulphur removal is about 0.5d. per therm (depending on local conditions and size of unit), which is regarded as insignificant with the saving achieved by the higher quality of the processed material.

Plants have been utilized in the glass, pottery and metallurgical industries, but are capable of application in wider fields where a low sulphur gas is required.

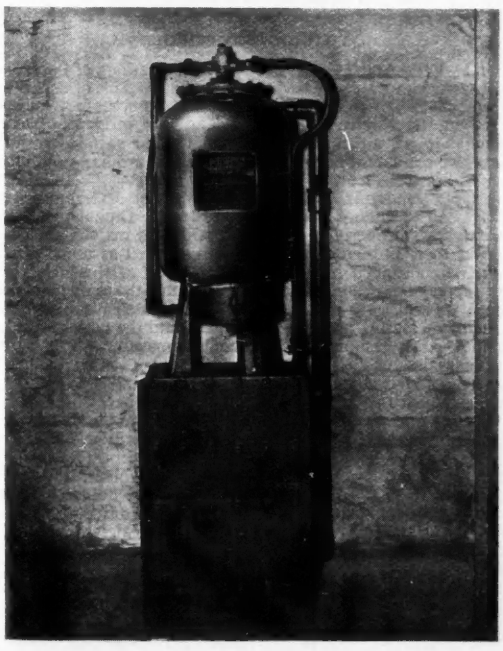


FIG. 15.—*Industrial C.S.R. plant, capacity 250 cu.ft. per hour.*

Description of Plants (Prov. Pat. Nos. 10360/44 and 25586/44)

It is not proposed to describe in detail the earlier types of industrial plants which were installed, as these have been superseded by more up-to-date designs. The first industrial converters were electrically heated, and had a capacity of 120 cu.ft. of gas per hour. A similar type was arranged for gas firing. Finally the general types were evolved which are illustrated in figs. 15, 16, and 17.

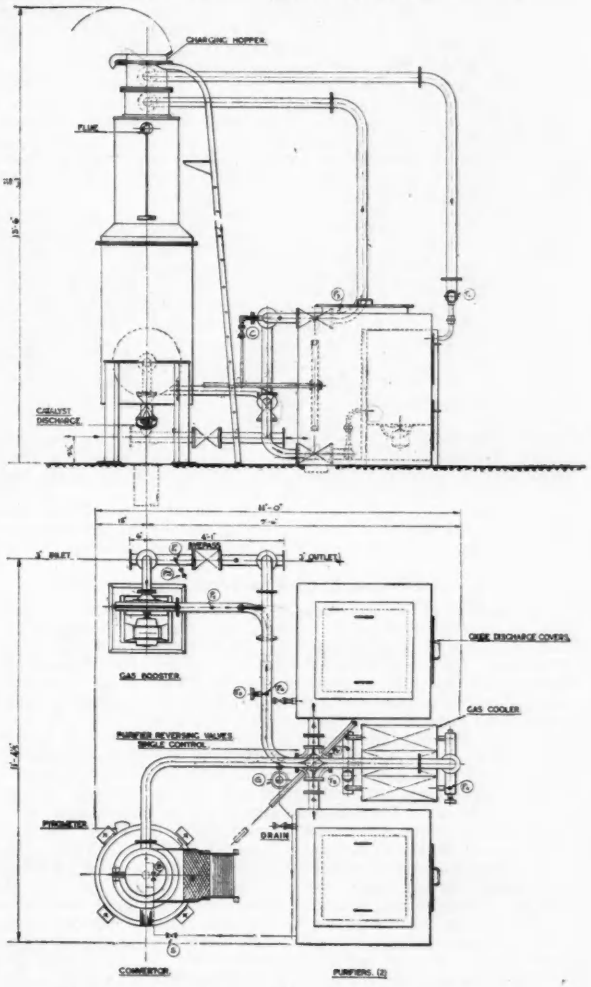


FIG. 16.—*Arrangement of desulphurizing plant; capacity 4,000 cu.ft. per hour.*

Six pressure points at P, each fitted with ½-in. Audco Fig. 123 cocks.
4-in. dial thermometer at T_1, 0/200°C.
4-in. dial thermometer at T_2, 0/100°C.
4-in. dial thermometer at T_3, 0/100°C.
1-in. gas regulator at G on gas supply to burner.
1-in. Audco Fig. 123 cock on gas supply to burner at S.
½-in. Audco Fig. 123 cock on thermostat by-pass at B.
½-in. Audco Fig. 123 cock on pilot supply to burner at PS.
Two 1-in. Audco Fig. 67 cocks on purifier drains.
Three 3-in. Audco Fig. 511 cocks inlet, outlet, and by-pass.
Two 3-in. Fourway Audco valves Fig. 4660, purifier reversing valves.
One 3-in. service regulator installed at convenient point on gas outlet line.
One 1-in. Audco Fig. 123 cock at C. To be open only during change-over of purifier reversing valves.

(To be concluded)

COMPANY MEETINGS

British Gas Light Company

The 215th Ordinary General Meeting of the British Gas Light Company was held at the Chief Office of the Company, 2, The Abbey Garden, Westminster, S.W. 1, on Wednesday, Mar. 27, Mr. HENRY WOODALL, M.Inst.C.E. (Chairman and Managing Director), presiding.

In the absence of the SECRETARY (Mr. A. J. Mumford), who was indisposed, the Assistant Secretary (Mr. F. T. Brookes) read the notice convening the meeting, together with the reports of the Auditors. The Directors' report and statement of accounts for the year ended Dec. 31, 1945, were taken as read.

The CHAIRMAN, moving the adoption of the report and accounts, said: For the first time for over six years I now have the opportunity of telling you quite freely about your undertaking, its troubles and success, and the news I can give you is that in spite of many difficulties and much damage to our property during the war our financial position remains as sound as ever.

On looking back over the last 30 years since I was elected to the Board I can justly say that the period has been one of progress and expansion. Unfortunately, however, the six years of war, with their accompanying shortages and controls of both material and labour, have prevented our carrying out some of the very important schemes for linking up our undertakings which, indeed, in many cases, were the reason for and formed part of the plan which guided us in purchasing the control of a number of them.

For something like a century this Company was unique in its centralized control of gas undertakings. I shall have something to say to you later on the question of the nationalization of our Industry, but I can state that after an unrivalled experience of these matters in this Company we are convinced that the policy being pursued by us and the plans we had made and intend to carry out if we are allowed to do so are on the right lines, and are those which will afford the greatest benefit to the consumer, who, after all, is the person who matters and whose interests must first be studied.

With the end of the war it is reasonable to hope that some of the checks on our expansion will be removed, and I felt that the time had come for me to seek further assistance. I therefore asked, with the full concurrence of the Directors, the Deputy Chairman, Mr. Harold G. Palmer, if he would share with me the office of Managing Director. I am glad to tell you that he has consented to do so. There is no need for me to say how valuable is his assistance and counsel, to which is to be added his long experience of the Company. He, and his father before him (who was at one time Chairman of this Company), have now between them served on the Board for a continuous period of 65 years.

At this stage may I say how pleased we are to welcome back to our Board Mr. Edward Woodall and Mr. Henry Jones, both of whom have been on war service since 1939. We also have available to us once more the advice and services of Mr. Geoffrey Gibbs, who has been doing highly important work for the Ministry of Economic Warfare, and I think it is not unfitting to mention that all three have been honoured by His Majesty the King for their services.

Dividend at Pre-War Rate

Now to turn to the Accounts. It is gratifying to be able to report that, as a result of the year's working, after meeting all charges and the preference dividends, there is £34,772 available for ordinary dividends. Out of this sum the interim dividend of 3%, less tax, amounting to £12,825, was paid in October. Your Board have given very full consideration to the question of the rate that they should recommend to you for the final dividend and, as will be seen from the report, they decided in favour of a return to the pre-war rate of 7½% for the year, which entails a final dividend of 4½%, less tax, and will absorb £19,238, leaving £2,709 to be added to the carry forward.

We were fortified in this decision not only by the fact that the profits available for the year were ample, but by the existence of the very substantial balance in the carry forward on Profit and Loss Account in addition to a General Reserve Fund of £275,000. This latter Fund is invested, principally in gilt-edged securities, of which the present market value is over £300,000. Lastly, 7½% was the Company's established rate of dividend from 1923 until 1940, when it was considered advisable, in view of war risks, to reduce the rate to 6%. You will doubtless agree that it is appropriate that we should now return to the old rate of dividend.

The satisfactory results are largely attributable to the very successful working of our two major stations, Hull and Norwich. At Hull there has been a marked recovery after the loss of business in the early years of the war, and at Norwich, although actual profits earned this year appear lower than in recent years, owing to heavy charges to revenue arising out of the reconstruction of the carbonizing plant, the station reserve fund has fulfilled its purpose of providing the sum necessary to make up the profits to the full amount we are entitled to receive from that Station.

Profits from the smaller stations and dividends from the subsidiary companies are in some cases less than last year, the reason being that the further increases in the cost of coals and the rates of wages have outstripped the additional revenue from increased sales and other sources, so that it will be necessary to apply to the Ministry of Fuel and Power for authority to raise the price of gas in several cases.

In connexion with the reference I have made to the recovery at the Hull Station, it may be of interest to mention our experiences there and at some other undertakings and to give you a few comparative figures. In 1938 we sold at Hull over 1,500 million cu.ft. of gas, but in 1941 the sales were only 1,000 million cu.ft. Last year we had so far recovered that we sold 45% more than in 1941, and only 2¾% less than in 1938. At Norwich there was only a small decline after the outbreak of war, and last year we reached a record sales figure of 951 million cu.ft., compared with 738 million cu.ft. in 1938. As was to be expected, coastal towns were more seriously affected than those inland. Our sales, for instance, at Gorleston and Westgate were down by as much as 50%, but here, again, there has been a marked recovery as at Hull.

On the other hand, at many of our inland Undertakings there have been phenomenal increases in sales during the war period, and the greatest credit is due to the Engineers and staff, who have had to meet exceptional demands which have taxed their plants and themselves to the utmost. To summarize, the total of the sales in 1945 at all the Company's Stations and Subsidiaries was nearly 10% more than in 1944, and 21% more than in 1938.

Nationalization

The present Government has announced its intention to nationalize the Gas Industry, and undoubtedly it is in a position to do so. It should not be forgotten that Parliament has already very wide powers of control over our Industry. We do not believe that nationalization would increase the efficiency of our Industry, or add to the convenience and satisfaction of the consumers. So far we have had no sufficient reasons given us for so great an upheaval. Complaint has not been made that the Industry has failed to conduct its affairs efficiently and economically—indeed, on the contrary, in May, 1945, the then Minister of Fuel and Power expressed his gratitude for its great efforts in the national cause. No change of ownership is necessary because of the relations between employers and employees—these are excellent, as is evidenced by statements made by the National Joint Industrial Council for the Gas Industry, representing as it does employers and employees.

The British Gas Council (of which this Company is a member) does not support nationalization as an economic principle applicable with advantage to the affairs of the Gas Industry. Following an Employers' Conference held in Westminster on Mar. 7, when an appeal was made by the Prime Minister and other Ministers of the Crown for the fullest co-operation of Employers in the Government's drive for prosperity, and when the urgent need for maximum production during the next two or three years was stressed, the British Gas Council considered it its duty to urge most seriously and earnestly that the Government should declare that any nationalization plan would be postponed for at least the period during which it was made clear that maximum production is so essential.

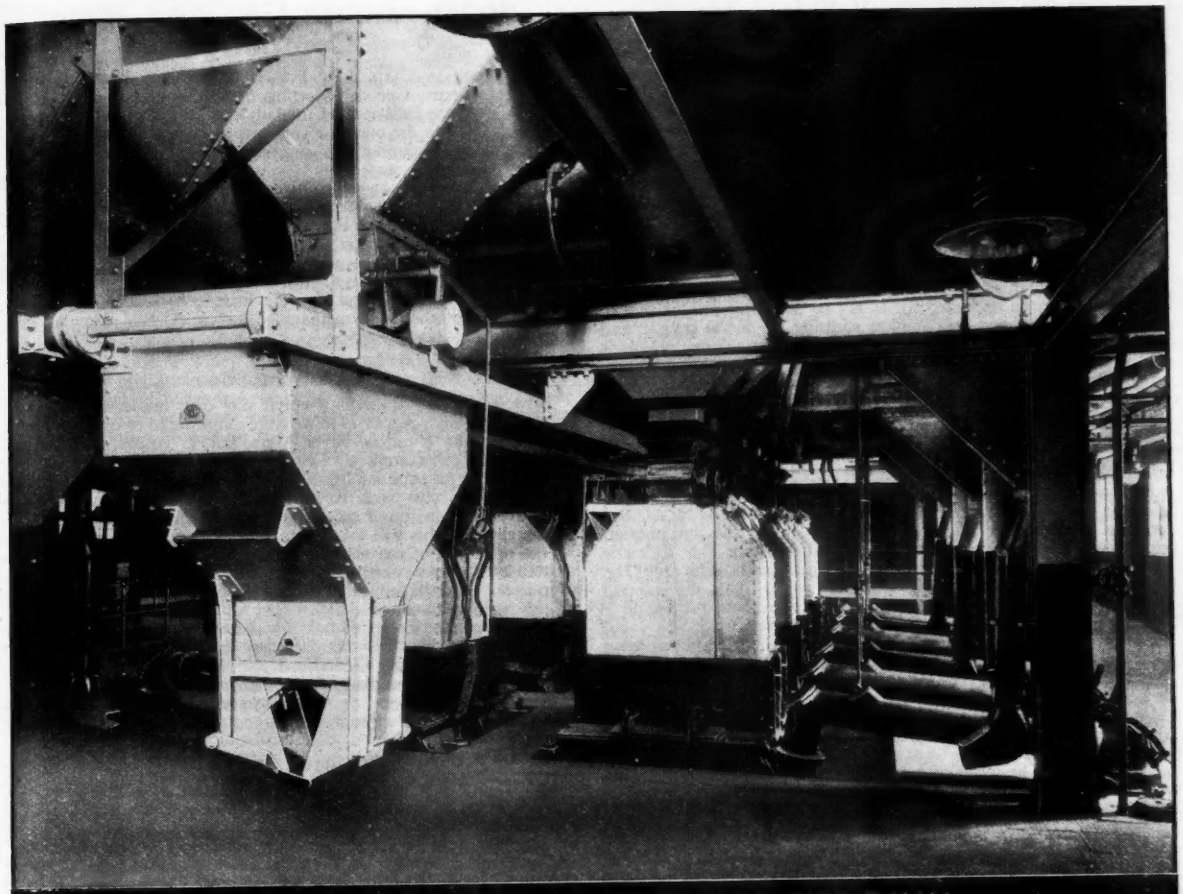
Your Directors give full support to the British Gas Council in the policy they have adopted and the action they have taken. The important point now is that the existing uncertainty be removed, and that the Gas Industry should be encouraged in co-operation with the Ministry of Fuel and Power to develop on evolutionary lines.

Wartime Experiences

Now I will try to tell you in a few words something of the difficulties and dangers with which we had to contend as a result of enemy action. You will realize that with so many of the Company's Undertakings situated in the eastern half of England our properties were very vulnerable to air attack, and although we did sustain considerable damage, we can count ourselves fortunate that we had nothing in the way of a disastrous loss.

Our major Undertaking at Hull suffered most. The inhabitants of that city had to endure many severe ordeals. Damage was done to the Company's property at Hull in 34 raids and major damage in six. No fewer than 39 high explosive bombs, as well as numerous incendiaries, were dropped in the gas-works. Ten of the high explosive bombs actually hit manufacturing plant, and the remainder, mostly in close proximity to the holders, caused extensive blast damage. The main condensing plant was destroyed, and the tank of our largest 3½ million cu.ft. gasholder was severely damaged, putting part of it out of commission. The second largest 2¼ million cu.ft. holder was completely destroyed. At the time it contained two million cu.ft. of gas, sufficient to supply about half the City for 24 hours, and this gas burnt in a few minutes, forming a beacon hundreds of feet high. The loss of storage has reduced our holder capacity at Hull by nearly 50%, but I am glad to tell you that we have recently let the contract for the reconstruction of the 2¼ million cu.ft. holder, and when this is complete we shall be able to spare the largest holder for repair.

Amongst other incidents were direct hits on the fitting shops and stables, and on an air-raid shelter, which fortunately at the time was unoccupied; a piece of the shelter was hurled into the air and dropped into one of our gasholders 130 yards away. On the district 500 gas mains were fractured, over 3,300 services were damaged and cut off, nearly 9,000 meters and 5,500 of the Company's cookers had to be removed from damaged property. Something of the intensity of the major raids and the strain on our personnel will be realized when I tell you that of the figures I have quoted for damage on the district, between 50% and 60% occurred in two raids on successive nights.



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COMPANY MEETINGS—cont.

On three occasions in 1941 the damage on the Works or in the City was such that it was necessary to shut off the gas supply—the first time this had happened in more than a century. No employee at Hull was killed or injured while on duty, although unfortunately some were killed by enemy action while at home. Several were injured, and it is with pride that I mention that although a considerable number had their homes destroyed or severely damaged, they were present at work as usual on the following day to assist in repairs to plant and mains in order to reinstate and maintain the gas supply to the district.

Damage at Norwich

Norwich was subjected to many attacks, some of a major nature, and the damage to house property was very extensive. In raids on two successive nights we had no fewer than 100 mains fractured. Pressures had to be restricted for a day or two after one or two of the raids, but there was no complete shutting off of the supply, and gas-making continued at all times without intermission, which is greatly to the credit of the retort house men and other works personnel who, with our district men, did magnificent work with complete disregard for personal safety.

I must further single out for special mention Gorleston and Westgate. Both were persistently subjected to the great strain of the "tip and run" raider. At Gorleston we did suffer some severe damage in that we had a direct hit on our vertical retort house which prevented us from making any gas there for six months, and we lost our largest holder, as well as the foreman's house, laboratory, and testing station; there was also the usual damage to mains on the Works and district. Fortunately, when the retort house was hit we were able to make arrangements for a supply of gas in bulk into our holders from the Works of the Great Yarmouth Gas Company. This necessitated laying a supply main in a tunnel under the river, and putting in a boosting plant in connection therewith, all of which work was done, and we were ready to take the supply before it could be given, since our friends at Yarmouth had to put on additional plant for our needs.

On the other hand, at Westgate, situated as it is on the coast of the Isle of Thanet, we might have expected to share something of the destruction which was experienced by our neighbours at Ramsgate, but in point of fact, despite a direct attack on our Works by a sneak raider, one of whose bombs went right through our No. 3 holder, hit the Works office, bounced and exploded some four hundred yards away, and another which was dropped in the yard, missed the top of another holder, and again exploded harmlessly, we suffered practically no damage.

Tribute to Employees

From the little I have been able to tell you, you will realize the strain on our personnel and something of the difficulties with which we have had to contend, and when there is added to these the further unpleasantness of working in retort houses completely blacked out, with consequent lack of ventilation, you will agree with me that we owe our Engineers, their staffs and the men a great debt of gratitude for the way they maintained supplies. As you know, we have 18 stations, 23 subsidiaries, and a chemical works; every man and woman did their duty, and it would be invidious to mention any by name. We do not forget the 350 of our men who joined the Forces. Some of them will never return, and we offer their relatives our heartfelt sympathy. Many of our men have returned; others are coming back from day to day, and we cordially welcome them, and are happy to know that most of them are wishful to rejoin their old Company.

The report and accounts were adopted, and the dividend resolutions as indicated in the Directors' report were carried unanimously.

The retiring Directors, the Viscount Mersey and Mr. E. C. Woodall, were re-elected, and the Auditors, Messrs. Cash, Stone & Company, were reappointed, Mr. Wm. Cash, jun., briefly acknowledging this renewal of confidence.

The CHAIRMAN proposed a vote of thanks to the Secretary, officers, staff, and workpeople of the Company, and made special mention of the Secretary, who, for the first time, was absent from the meeting owing to illness. Already in his address he had paid tribute to the sterling efforts put forth by all. Having many undertakings on the east coast, few companies had suffered greater trials and strain than this Company, but no one had shirked his duties, and they had come through amazingly well.

The DEPUTY CHAIRMAN (Mr. Harold G. Palmer) seconded the vote of thanks, which was carried unanimously.

The ASSISTANT SECRETARY, acknowledging the vote on behalf of the staff and workpeople, said there existed between the Directors and employees to a very high degree that personal understanding which commanded their loyalty and created that team spirit which had enabled them to come through the crisis so well. They counted it a privilege to serve the Company, and hoped that privilege was not going to be wrested from them.

Mr. K. R. MACKAY proposed a vote of thanks to the Chairman and Directors for their able management of the business of the Company, and congratulated them on their satisfactory balance-sheet.

Commander HYDE C. BURTON, in seconding, said he hoped the Board would be filled with the fighting spirit in regard to nationalization.

The CHAIRMAN briefly replied.

Bournemouth Gas and Water Company

Mr. WILLIAM CASH, J.P., F.C.A. (Chairman), presiding at the Annual Ordinary General Meeting of the Bournemouth Gas and Water Company, held at the Company's offices, 48, Copthall Avenue, London, E.C., in the course of his speech said: All through the war we were able to maintain our supplies of gas and water to our consumers. I desire to record our supply to the Air Ministry of hydrogen gas, which was acknowledged with much appreciation. The plant was put to work in October, 1940, and the quantity of hydrogen produced and supplied to the Royal Air Force by the end of September, 1944, was 286,000,000 cu.ft., an output the highest achieved by any gas-works. On research work we have, in conjunction with the Gas Research Board and Leeds University, and by arrangement with the Air Ministry, erected plant for the hydrogenation of coal and to explore the synthesis of methane. This work has attracted great interest in the Gas Industry.

Water Supplies

Now let me say something about our own immediate problems. By the Company's Act of 1940 we were empowered to obtain a further supply of water from the River Avon, but, of course, work on this scheme has been completely held up during the war. Our demand for further water supplies steadily grows, and we are anxious now to proceed. We have received now from the appropriate Ministry authority to lay, with our own labour, the trunk mains from the Avon to Longham. This will take some time, and must be followed later by the provision of the necessary buildings and plant, and these are in course of preparation. This work in all will require a large sum of money, but at the moment I cannot tell you the amount or character of the required finance.

You will also be interested to know that we have deposited an Order to enable us to transfer to our Company the undertaking of two more small gas undertakings—Blandford and Fordingbridge. This ever-successful policy of integration over many years has brought to many small towns cheaper gas and improved service, covering also intervening areas hitherto without a supply of gas.

Growth of Gas Sales

In 1945 our sales of gas showed an increase of 3.72% over 1944, and amounted to 16,550,674 therms of 400 c.v. gas. Our price was raised on July 1, 1945, by 1d. to 13d. per therm—a very reasonable price, particularly having regard to the increasing cost of coal, labour, and materials generally. In 1945 coal has cost us 5s. 9d. per ton more than in 1944 and an increase in two years of 11s. per ton. It is, of course, true that increased receipts from residual products have helped us, but the increased costs of coal oil and coke less residuals show a net additional cost of £13,500 in 1945.

In our revenue account gas charges show a total increase of £132,576, and from the comparative figures printed in the account there has been an increase in nearly every item, notably in the item of repairs and maintenance. Receipts under all headings are up by £112,882 and, as a result, the balance transferred to net revenue account is less by £17,719, but water profit is more by £3,451. The water rental is more by £14,706. In the expenses, maintenance and repairs charge is more by £7,453, and pumping costs, wages, and rates are increased. In both the accounts allowances to dependents of men serving is, of course, declining now that the war is over.

Dividends Maintained

The net revenue account calls for some comment. There is a credit of £20,320 under the head of income-tax, but, after this has been done, the balance-sheet position us that we have a credit balance on the income-tax account, and also a reserve for tax which the 1945 profit will attract payable on January 1, 1947. There is a final credit in the net revenue account for £21,337, being realized profit on investments sold over a number of years hitherto held in suspense against a possible fall in value of investments. Thus our financial position in this respect is as follows: Reserve fund cost £219,324, market value £233,195; special purposes £71,171, market value £82,468. The pension fund investments also stand well, the cost being £593,896, with an excess on valuation of £40,828.

We have again reserved for a possible contribution under the long promised war damage scheme and our present reserve is £53,452, which we believe to be adequate. On the other hand, we have claims outstanding on the balance-sheet for £32,276. We have not allocated any sum this year for deferred repairs, but we have written off as depreciation, as is shown in the assets statement D, £78,134, and we transferred to renewal fund (K) £17,726, this fund having borne a charge of £39,262 for renewals actually effected. The whole financial position may be summed up by saying that we are paying the same dividends as in 1944, and are reducing our carry-forward by £2,876 to £6,942.

Nationalization

You will expect me to say something about nationalization. This is a slogan adopted by the present Government to be applied to many industries, including gas. The Heyworth Committee appointed by

COMPANY MEETINGS—cont.

Major Lloyd George as Minister of Fuel on June 12, 1944, reported on November 1, 1945. The committee in paragraph 227 of their report say " that within the limits of the existing structure the industry to-day is reasonably efficient."

The directors of this Company do not agree that nationalization is necessary or desirable, or that the scheme of regionalization would benefit the consumer or produce cheaper gas. Moreover, in our case, the policy adopted by the Company in its past history has been to extend our activities and the benefits our company can confer to smaller undertakings, and in seven cases—Poole, Christchurch, Lymington, Ringwood, Wimborne Minster, Brockenhurst, and Wareham—we have taken over smaller gas companies, have reduced the price of gas and introduced our service to the consumer, and, as already stated, we are hoping to add two more concerns to our district. Again with us our whole staff and organization is trained on the lines that we are out to consider the consumer and help in every way. This Company and, in fact, the whole industry conduct their business so that we have no quarrel with our employees, and our technical officers and staff are highly and efficiently trained for their work. The British Gas Council do not accept the principle of nationalization, nor do they accept the scheme suggested by the Heyworth Committee if nationalization is forced on the Industry. It must never be forgotten that the statutory undertakings are now controlled by Parliament in many directions as to capital, dividends, reserves, price of gas, &c.

Developments Go On

In the meanwhile, developments must go on, and our renewal programmes cannot be postponed, particularly in such a case as ours, where our outputs steadily increase. This Company is both a gas and water company, and, if our gas undertaking is acquired, we should have a claim for severance. A considerable part of our organization deals with both undertakings, and we should be left with the one business only. Our costs would be relatively higher.

I can give you no information as to how the compensation payable under nationalization will be dealt with or how the Preference and Debenture stocks would be treated. Meanwhile, I understand that, without admitting that nationalization is desirable or necessary, the British Gas Council are preparing a considered criticism of the Heyworth Report for submission to the Minister. Your directors will continue to watch the interest of their stockholders and employees, and they express the hope that so far as opportunity offers they, on their part, will not fail to express their views.

The report and accounts were adopted.

Making Ideal Kitchens

Warrington housewives were introduced to post-war kitchen models and units at a successful exhibition held at the Gas Showrooms from Mar. 11 to 23.

Full-scale kitchen units, comprising cooker, sink, draining-board, cupboards, and refrigerator, were exhibited, together with models of Jane Drew kitchens and an attractive water-heating display. Films on the planning of kitchens were also shown at intervals.

The exhibition was opened by the Chairman of the Warrington Gas Committee, Alderman J. Poole, and in an introductory speech Mr. W. H. T. Johns, Engineer and Manager, stressed the necessity of co-ordination between the Gas Committee, architects, and builders, in the matter of kitchen planning.

Reports on German Industry

Further reports submitted by teams of industrial experts, who have visited Germany under the auspices of the Combined Intelligence Objectives Sub-Committee and the British Intelligence Objectives Sub-Committee for the collection of scientific and technical intelligence from German industry, are now available. Among them are:

CIOS XXXI—24. Fuel Research and Technology at Rheinisch-Westfalisches Kohlen-Syndikat, Essen, price 1s., post free 1s. 1d.

CIOS XXXI—25. Fuel Research and Technology, Bergbau-Verein, Essen-Heisingen, price 1s. 6d., post free 1s. 7d.

CIOS XXXI—29. Fuel Research Activities. The A.G. Der Kohlenwertsoff-Verbande, Bochum, price 1s., post free 1s. 1d.

BIOS 199. *Ten Years of Oxygen-gasification at Leuna,* by Oberingenieur Sabel, price 4s. 6d., post free 4s. 8d.

CIOS XXXII—90. Wintershall AlGlk Lutzkendorf: Schmalfeldt gasification plant for making synthesis gas, Fischer-Tropsch plant, hydrogenation plant and catalyst factory. Lubricating Oil, price 3s. 6d., post free 3s. 8d.

CIOS XXXII—92. Brabag I Plant. Bohlen: Liquid fuels from brown coal by hydrogenation and Fischer-Tropsch processes, &c., price 3s. 6d., post free 3s. 8d.

The reports are on sale at H.M. Stationery Office.

Heavy Engineering Achievements

Unlike many other engineering firms, Simon-Carves, Ltd., were not called upon to divert their energies to new and unfamiliar forms of war work. Owing to the national importance of the several branches of heavy engineering in which they specialize they were able to make an outstanding contribution to the urgent need for fuel, steel, power, and explosives without any dislocation or re-adaptation of an already highly efficient organization.

The chemical plant department was responsible for nearly all the sulphuric acid installations built in Britain during the war, as well as for several abroad. Altogether the department built 22 contact sulphuric acid plants, ranging from 9 to 55 tons of acid per day, ten of which were ordered for Government explosives factories at Caerwent, Wrexham, Ranskill, Drigg, Dumfries, Powfoot, and Girvan. It also built an acid plant at Haifa, and three in the Persian Gulf, one of the latter—a 55-ton unit—being put into operation in the remarkably short time of ten months after the placing of the order.

A notable contract, now nearing completion, was received from the Asiatic Petroleum Co. for a sulphuric acid plant in Curaçao, Dutch West Indies, with an output of 200 tons per day in a single unit. This contract also included a new type of plant for the decomposition of sludge acid. Three sulphur recovery plants were supplied to the Anglo-Iranian Oil Co., in Abadan, enabling the Company to obtain its sulphur requirements without having to rely on imports. Sixteen electrical precipitation plants were also built, including one in South America and four in India.

The coke oven department completed or put under construction 683 ovens during the war, representing a total coking capacity of 12,162 tons per day. This includes 54 ovens for the Margam works of Guest Keen, Baldwin, 42 ovens for the Turkish Iron & Steel Company at Karabuk, and two complete coking installations of 55 ovens each for the Tata Iron & Steel Co., Ltd., the largest steelworks in the British Empire, which now operates a total of 164 Simon-Carves ovens. Nearly all the steel production of Turkey and India depends on coke made in plants built by Simon-Carves, Ltd.

The coal washer department built and put into operation seven coal washeries with a combined capacity of 1,300 tons per hour, and now has in hand four coal preparation plants totalling 750 tons per hour. Its war work also included three pyrites recovery plants for the Ministry of Supply (Sulphuric Acid Control), a large phosphate rock handling and storage installation for the same Ministry, and two froth flotation plants, in addition to coal-handling equipment and extensive civil engineering work for collieries and steel-works.

An outstanding contract was secured by the boiler department for the U.S.S.R. Power Station No. 5A, in which they acted as agents for the Ministry of Supply for the design, manufacture and supply of the whole of the equipment for a complete composite heat/power station of 50,000 kW. capacity. This contract covered all the steam-raising plant, including three boilers of 330,000 lb. per hour each, and also the turbo-alternators and the whole of the associated steam and electrical equipment complete with district water-heating plant and all auxiliaries. As a result of their work on this contract Simon-Carves, Ltd., received a further contract for Power Station No. 18A, in which they were the main contractors for the design and supply of three large boilers fired by pulverized fuel, producing a total of 750,000 lb. of steam per hour.

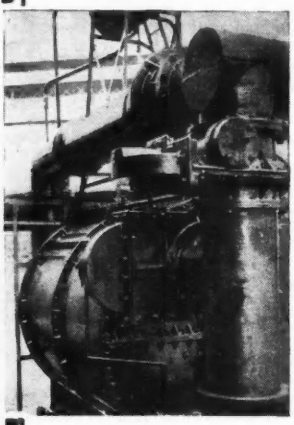
Five complete boiler units were supplied to Imperial Chemical Industries, Ltd., at Heysham, and a 330,000-lb. boiler to Stockport Corporation. One complete steam-raising plant was built for the Shelton Iron, Coal & Steel Co., Ltd., four for Warrington Corporation, and six for Blackburn Corporation. The combined capacity of the boilers built in Britain is more than 1,380,000 lb. of steam per hour.

Falkirk Gas Committee has accepted a tender by Henry Balfour & Co., Ltd., Leven, for the delivery and erection of gas purification plant, comprising gas condensers, detarrer, and static washers, at a cost of £10,760. The tender does not include the cost of foundations, water, liquor, and tar connexions, and electrical services, which are estimated to cost £500.

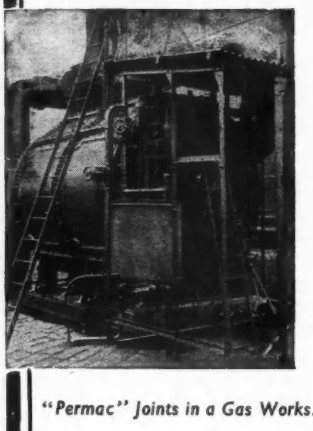
Ascot Gas Water Heaters, Ltd., have removed their Cambridge Branch office from 79, Regent Street, to more spacious premises at 35, Hills Road, Cambridge. (Tel. Cambridge 54503.) It is part of the Company's post-war policy to provide every facility at branch offices, particularly with regard to training and service for the individual areas throughout the country. Due to increased telephonic communications a new service has been installed at the West End offices, 8, South Street, W. 1 (off Park Lane), and the number amended from Grosvenor 2771 to Grosvenor 4491.

A Dinner, Concert and Dance, arranged by members of the Comforts Fund Committee of the Oxford Gas Company Sports Club, was held on Mar. 20 to welcome home members of theC ompany who have been on active service. There were about 170 present, including Directors, their wives, and the wives of many of the employees. The toast to "Those who served" was proposed by Mr. A. Tran, General Manager, and Mr. H. S. J. Ansell, Director, replied. Mr. H. M. Lodge, Chairman of the Board, responded to the toast of "The Company," proposed by Mr. K. Grierson. A vote of thanks to the Committee for their work during the War, proposed by Mr. F. Harris, was acknowledged by Mr. R. Bint, Secretary of the Committee.

When a Joint leaks—



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.

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"Permac" the original Metal-to-Metal Jointing makes leak-proof joints that last till you want to break them down. Stands up to all temperatures and pressures. Equally successful on steam, gas, water, oil joints.

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PRODUCTS PRICES

The London Market April 1.

There are no changes to report in the prices of Coal Tar products, the majority of which are controlled either by Government Order or by agreements.

The following are controlled by Government Orders at the prices indicated:—

Road tar at 5¼d. per gallon filled into buyers' tanks at sellers' works, with corresponding prices when delivered and when supplied in packages.

The price sprayed direct on to roads is controlled by agreement and is 8½d. per gallon for full tank loads in London and adjacent counties.

Creosote for hydrogenation is based on 5.875d. per gallon and creosote for timber preservation on 5½d. per gallon *ex* sellers' works, with the usual extras for different qualities, packages, &c.

The basic price for cresylic acid is 3s. 6d. to 5s. per gallon, according to grade.

Hot pressed naphthalene costs £11 11s. in bulk *ex* distillers' works. Prices for refined naphthalene vary from £20 15s. per ton for crystal on 50-ton contracts to £26 15s. per ton for ball and flake. These prices are delivered England and Wales in 2-cwt. bags, minimum 4-ton lots.

The maximum prices for coal tar naphtha vary from 1s. 11d. to 2s. 11d. per gallon and for xylol from 3s. 3½d. to 3s. 6d. per gallon delivered buyers' address in minimum 1,000-gallon lots in bulk. The maximum price for pure toluene is 3s. 2¼d. per gallon in bulk *ex* sellers' works.

The following prices are controlled by agreements:—

Pitch for briquetting is 70s. per ton *ex* sellers' works in bulk.

Phenol is 9½d. to 11½d. per lb. in large returnable drums delivered buyers' address, according to quantity.

The Provinces April 1.

The average prices of gas-works products during the week were: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gallon; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by S. R. & O. 1943, 1538, and for naphthalene by S. R. & O. 1944, 1051. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

The bulk of the pitch produced in this country is required for home trade purposes, but certain quantities are being sent at higher prices to Allied countries with the approval of the Coal Tar Control. So far as creosote is concerned the bulk is required for essential purposes, at controlled prices. With regard to hydrocarbon oils, the prices remain fixed, although there is more freedom than was previously the case.

Scotland Mar. 30.

Market is short of supplies and prices remain firm. Refined tar*: Yield to the Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d. Hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7½d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

TRADE CARDS

FULL particulars of these spaces can be obtained on application to the Publishers. They are designed principally for the use of the firms whose display advertisements cannot be included owing to paper rationing.

LEONARD BOTT LIMITED
Holyhead Road, Wellington, Shropshire.
T/A Leonardbot, Wellington, Salop.
T/N Wellington Salop 320.
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Repairs and New Work Supervised.

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GAS STOCKS AND SHARES

A general recovery took place at the commencement of business on the Stock Exchange last week on the news that Russia was withdrawing her troops from Persia. But subsequently the attitude of the Russian delegate at the Security Council caused a setback. Markets refused to be stampeded, however, and closed firm with an improved demand, especially for British Funds.

The volume of business among Gas stocks and shares was about on a level with that of the previous week, with prices on the whole remaining firm. It will be seen that on the week there were very few movements either way and no special items of interest. Even when compared with a month ago quotations have changed very little and any differences have been small.

Gas investors have doubtless noticed that in common with other public utility undertakings, the chairmen of gas companies in their annual reports have indicated in no uncertain terms their grave misgivings as to the benefits to be derived from the Government's nationalization programme. The electorate of the country, however, has decided these events and it remains to be seen whether they will ultimately be satisfied with the results attained.

The following were the changes in price last week :—

OFFICIAL LIST

Associated Gas & Water 4½ p.c. Red. Cum. Pref.	19/6—21/6	−−/6d.
Bombay	41/—43/−	−−/6d.
Gas Light 4½ p.c. Con. Pref.	100—103	+1
Ditto 3 p.c. Deb.	90½—93½	+½
Ditto 4½ p.c. Red. Deb.	105½—108½	+½
Imperial Continental Ord.	112—115	−1
Oriental	208—213	+1
Primitiva Holdings Ord.	11/3—12/3	−−/3d.
Swansea 5½ p.c. Red. Pref.	103—108	+1
United Kingdom Gas Corporation Ord.	20/6—21/6	−−/3d

SUPPLEMENTARY LIST

Eastbourne "B" (x.d.)	98—103	Mar. 25.

PROVINCIAL EXCHANGE

Hartlepool Ord.	100½—102½	+1½

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations March 28
1,767,439	March 11	30/−	40/−	Alliance & Dublin Ord. ...	120—125
900,018	Oct. 29	6d.	6d.	Assed. Gas & Water U'd'ts Ord.	20/—21/−
389,000	,,	7½d.	7½d.	Do. Deferred	20/—21/−
500,000	March 11	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6
536,000	,,	2	2	Do. 4 p.c. Red. Cum Pref.	19/6—21/−
342,000	,,	2	2	Do. 4 p.c. Irred. Cum. Pref.	19/—20/−
361,370	Feb. 18	70/−	70/−	Barnet Ord. 7 p.c.	155—160
300,000	Oct. 8	10½d.	8½d.	Bombay, Ltd.	41/—43/−
690,526	Feb. 11	70/−	70/−	Bournemouth 7 p.c. max. ...	153—158
362,025	Dec. 17	2	2	Do. 4 p.c. Deb. ...	100—105
659,955	March 4	41/−	50/−	Brighton, &c., 5 p.c. Con. ...	107—112
855,000	,, 11	60/−	90/−	Brit. Gas Light Ord.	122—127
545,000	Dec. 17	2½	2½	Do. 5½ p.c. 'B' Cum. Pref.	112—117
120,000	,,	2	2	Do. 4 p.c. Red. Deb.	95—100
100,000	Oct. 22	4/6	2½	Cape Town, Ltd., 4½ p.c. Cu. Pf.	13/—15/−
626,860	Feb. 11	50/−	70/−	Cardiff Con. Ord.	120—125
24,500	Nov. 12	8½d.	8½d.	Colombo 7 p.c. Pref. ...	23/6—25/6
764,169	Sept. 24	4.78d.	6d.	Colonial Gas Assn. Ltd. Ord. ...	17/—19/−
400,000	,,	7.649d.	9¾d	Do. 8 p.c. Pref. ...	23/—25/−
1,748,090	Feb. 25	—	40/−†	Commercial Ord.	66—69
620,000	Dec. 10	1½	1½	Do. 3 p.c. Deb.	82—87
286,344	Feb. 18	2½	2½	Do. 5 p.c. Deb.	111—116
807,560	,,	60/−	60/−	Croydon sliding scale	118—123
644,590	,,	50/−	50/−	Do. max. div.	102—107
620,385	Dec. 31	2½	2½	Do. 5 p.c. Perp. Deb. ...	117—122
179,500	Feb. 18	50/−	50/−	East Surrey 'B,' 5 p.c.	101—106
176,461	Dec. 27	2½	2½	Do. 5 p.c. Deb. (Irred.)...	117—122
239,135	Nov. 12	7½d.	6d.	Gas Consolidation Ord. 'A' ...	20/—22/−
250 000	,,	4½	4½	Do. Ord. 'B' ...	19/—21/−
250,000	,,	2	2	Do. 4 p.c. Red. Cum. Pref.	18/6—20/6
19,101,877	Feb. 18	6d.	6d.	Gas Light & Coke Ord. ...	21/3—22/3a
2,600,000	,,	35/−	35/−	Do. 3½ p.c. max.	84—87
4,477,106	,,	2	2	Do. 4 p.c. Con. Pref. ...	100—103
2,993,000	Dec. 31	1¾	1¾	Do. 3½ p.c. Red. Pref. ...	99—102
8,602,497	,, 3	1½	1½	Do. 3 p.c. Con. Deb. ...	90½—93½
3,642,770	,,	2½	2½	Do. 5 p.c. Red. Deb. ...	105—108
3,500,000	,,	2½	2½	Do. 4½ p.c. Red. Deb. ...	105½—108½
700,000	March 18	1⅞	1⅞	Do. 3½ Red. Deb. ...	97½—99½
5,600,000	May 28	—	†£10	Imperial Continental Cap. ...	112—115
43,340	Jan. 28	1⅞	1⅞	Do. 3½ p.c. Red. Deb. ...	99—102
2,167,410	Feb. 11	60/−	55/−	Liverpool Ord.	113—116
231,978	,, 18	50/−	50/−	M.S. Utility 'C' Cons.	101—106
918,657	,,	2	2	4 p.c. Cons. Pref.	100—103
675,000	Nov. 12	‡40/−	‡40/−	Montevideo, Ltd.	116—121
300,000	Dec. 10	£4	£6	Oriental, Ltd.	208—213
368,537	,,	57/6	50/−	Plymouth & Stonehouse 5 p.c.	108—113
621,667	Feb. 11	72/6	72/6	Portsmouth & Gosport Cons.	145—150
2,386,371	July 9	†9¾d.	†9¾d.	Primitiva Holdings, Ltd. Ord.	11/3—12/3
226,860	Dec. 10	3	3	Do. 6½ p.c. Red. Cum. Pref.	100—105
648,999	Sept. 10	6¾	6¾	Severn Val. Gas Cor. Ld. Ord.	20/6—22/6
597,972	March 11	2½	2½	Do. 4½ p.c. Cum. Pref. ...	20/—22/−
2,528,714	Aug. 27	6d.	3¾d.	South East'n Gas Cn. Ld. Ord.	19/6—20/6
1,000,000	Feb. 25	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6
1,068,869	,,	2	2	Do. 4 p.c. Irred. Cum. Pref.	19/6—20/6
5,709,895	,, 11	30/−	50/−	South Met. Ord.	91—94
1,135,812	,,	3	3	Do. 6 p.c. Irred. Pref. ...	122—127
850,000	,,	2	2	Do. 4 p.c. Irred. Pref. ...	98—102
1,895,445	Dec. 31	1½	1½	Do. 3 p.c. Perp. Deb. ...	88—91
1,000,000	Jan. 14	2½	2½	Do. 5 p.c. Red. Deb. ...	101—106
1,543,795	Feb. 4	50/−	50/−	South Suburban Ord. 5 p.c ...	107—112
512,825	,,	2½	2½	Do. 5 p.c. Perp. Pref. ...	109—114
500,000	,,	2	2	Do. 4 p.c. Perp. Pref. ...	98—103
250,000	,,	1¾	1¾	Do. 3½ p.c. Red. Pref. ...	97—102
888,587	Dec. 10	2½	2½	Do. 5 p.c. Perp. Deb. ...	117—122
750,541	Feb. 11	50/−	50/−	Southampton Ord.	104—109
350,000	,,	2½	2½	Swansea 5½ p.c. Red. Pref. ...	103—108
1,076,490	March 4	50/−	50/−	Tottenham & District Ord. ...	108—113
338,555	,,	2½	2½	Do. 5 p.c. Pref.	107—112
453,380	Dec. 10	2	2	Do. 4 p.c. Perp. Deb. ...	100—105
1,483 664	Nov. 12	7½d.	6d.	U. Kingdom Gas Cor. Ord. ...	20/6—21/6
1,085,952	,,	5½d.	5½d.	Do. 4½ p.c. 1st Cum. Pref. ...	20/—22/−
772,709	,,	4½d.	4½d.	Do. 4 p.c. 1st Red. Cum.Pref.	20/—21/−
745,263	,,	5½d.	5½d.	Do. 4½ p.c. 2nd Non.Cum. Pf.	19/—21/−
1,200,000	Dec. 17	1⅞	1⅞	Do. 3½ p.c. Red. Deb. ...	97—102
380,608	March 18	66/3	66/3	Uxbridge, &c., 5 p.c.	125—130
1,371,138	Aug. 13	50/−	50/−	Wandsworth Consolidated ...	107—112
2,525,768	Feb. 18	2	2	Do. 4 p.c. Pref.	100—103
1,343,964	,,	2½	2½	Do. 5 p.c. Deb.	118—123
383,745	Dec. 17	2	2	Do. 4 p.c. Deb.	100—105
558,342	,,	50/−	50/−	Watford & St. Albans Ord. ...	108—113

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations March 28
351,685	Dec. 17	2½	2½	Brighton, &c., 5 p.c. Perp. Deb.	117—122
415,250	,,	2	2	Bristol Gas Co., 4 p.c. New Deb.	101—104
140,205	Feb. 11	70/−	70/−	Cambridge, &c., 7 p.c. Cons. 'B'	135—140
295,932	March 18	50/−	50/−	Cheltenham, 5 p.c. Cons.Ord....	105—110
42,500	Dec. 17	2	2	Do. 4 p.c. Perp. Deb....	98—103
150,000	Feb. 25	2	2	Croydon Gas, 4 p.c. Pref. (Irr.)	97—102
130,000	Dec. 31	2	2	Do. 4 p.c. Deb. ...	100—105
53,220	Feb. 18	3	3	East Surrey, 6 p.c. Cum. Pref....	122—127
198,000	March 25	—	70/−	Eastbourne, 'B' 3½ p.c.... ...	98—103
117,425	Feb. 25	—	6⅜†	East Wight Cons. 5 p.c. ...	107—112
156,600	Feb. 18	50/−	50/−	Hampton C't, 5 p.c. Cons. Ord.	107 —112
18,000	May 28	—	£7	Malta & Med'n., 7 p.c. 1st Pref.	95—105
50,000	Feb. 18	52/3	52/3	Mid. South. Utili., 'A' Cons. 5 p.c.	105—110
70,380	Dec. 17	2½	2½	Newport (Mon.), 5 p.c. Deb...	113—118
65,000	Aug. 13	2½	2½	North Middlesex, 5 p.c. Pref. ...	107—112
70,000	March 11	2½	2½	Plymouth & Stone., 5 p.c. Deb.	115—120
76,501	Dec. 17	2	2	Reading, 4 p.c. Perp. Deb. ...	97—102
74,777	Oct. 1	2	2	Romford, 4 p.c. Debs. (Reg.) ...	98—103
363,575	Jan. 2	2½	2½	Tottenham, 5 p.c. Reg. Red. Mt.	98—101
202,019	Sept. 24	75/−	75/−	Tunbridge Wells, 4 p.c. Scale ...	137—142
135,257	Dec. 3	2½	2½	Uxbridge &c., 5 p.c. Perp. Deb.	118—123

PROVINCIAL EXCHANGES

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations March 22
804,948	March 4	2½	2½	Bath Cons.	112—114
122,577	Feb. 18	3	4	Blyth 5 p.c. Ord.	122—124
1,667,250	,, 11	2½	2½	Bristol, 5 p.c. max.	115—117
120,420	Dec. 17	2	2	Do. 1st 4 p.c. Deb.	101—103
415,250	,,	2	2	Do. 2nd 4 p.c. Deb. ...	100½—102½
328,790	,,	2½	2½	Do. 5 p.c. Deb.	119—121
157,150	Feb. 4	2½	3½	Chester 5 p.c. Ord.	114—116
52,500	Dec. 17	2	2	Do, 4 p.c. Cum. Pref. ...	98—100
40,000	,,	2	2	Do. 4 p.c. Non. Cum. Pref.	98—100
36,430	,,	1½	1½	Do. 3½ p.c. Deb.	87—91
41,890	,,	2	2	Do. 4 p.c. Red. Deb. ...	99—101
542,270	Aug. 7	4½	3	Derby Cons.	132—137
55,000	Dec. 17	2	2	Do. 4 p.c. Deb.	97—102
40,000	Feb. 18	5½	5½	Exeter 10 p.c.	185—195
10,000	,,	5	5	Great Grimsby 'A' Ord. ...	185—195
6,500	,,	5	5	Do. 'B' Ord. ...	185—195
79,000	,,	5	5	Do. 'C' Ord. ...	175—185
732,000	,,	2	2½	Hartlepool G. & W. Cn. & New	100½—102½
490,681	Dec. 17	1⅜	1⅜	Liverpool 3½ p.c. Red. Deb. Stk.	95—100
245,500	,,	2	2	Do. 4 p.c. Red. Deb. Stk.	102—104
306,083	Dec. 31	2	2	Do. 4 p.c. Deb.	101—103
680,000	Nov. 28	2½	2½	Do. 5 p.c. Red. Stk. ...	104—109
20,000	,,	2½	2½	Long Eaton 5 p.c. Pref.	9—11
80,000	,,	2½	2½	Do. 5 p.c. Deb.	117—122
2,430,267	Feb. 11	2½	2½	Newcastle and Gateshead Con.	24/—24/9a
682,856	,,	2	2	Do. 4 p.c. Pref.	99—101
776,706	Dec. 27	1½	1½	Do. 3½ p.c. Deb.	98½—99½
250,000	,,	1½	1½	Do. 3½ p.c. Red. Deb. ...	98½—100½
73,186	Oct. 29	2	2	Do. 4 p.c. Red. Deb. ...	102—104
106,280	Feb. 4	5	5	Preston 'A' 10 p.c.	188—193
188,219	,,	3½	3½	Do. 'B' 7 p.c.	144—149
1,806,339	Feb. 28	3½	3½	Sheffield Cons.	130—135
95,000	Jan. 7	2	2	Do. 4 p.c. Deb.	98—102
332,351	Feb 4	3	3	Sunderland 6 p.c. max. ...	122½—124½
192,150	,, 11	2½	2½	Weston-super-Mare Cons. ...	112—114
64,338	Dec. 31	2	2	Do. 4 p.c. Deb.	99—101
33,340	,,	3½	3½	Do. 7½ p.c. Deb.	145—150

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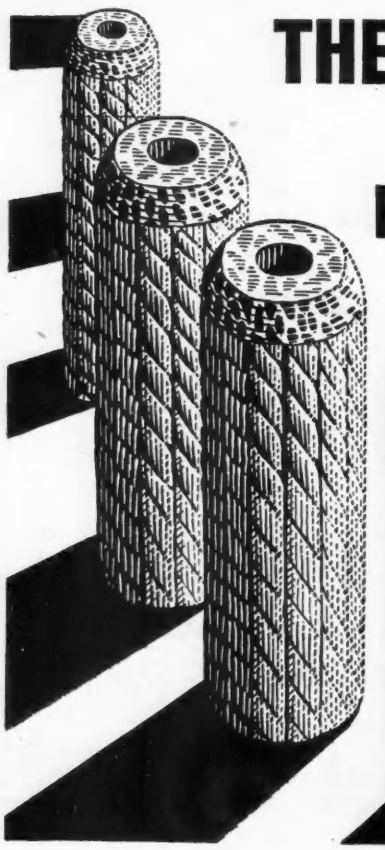

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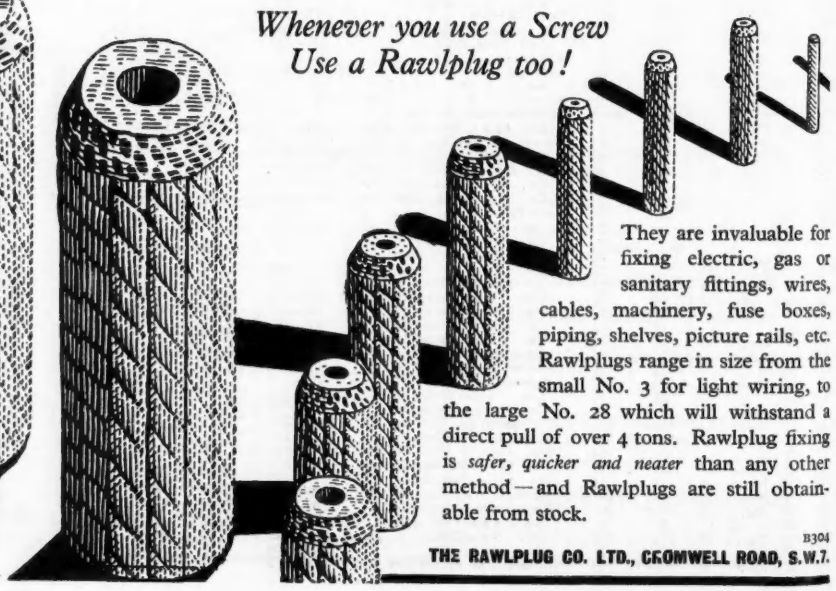

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